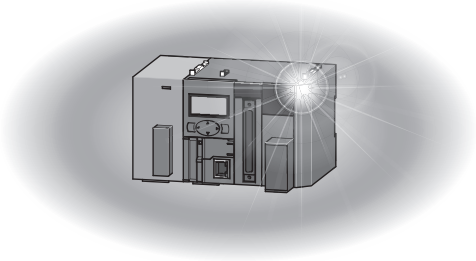
MITSUBISHI ELECTRIC

Mitsubishi Programmable Controller

MELSEC *L* series

MELSEC-L I/O Module User's Manual

-LX10
-LX28
-LX40C6
-LX41C4
-LX42C4
-LY10R2
-LY18R2A
-LY20S6
-LY40NT5P
-LY28S1A
-LY41NT1P
-LY42NT1P
-LY40PT5P
-LY41PT1P
-LY42PT1P
-LH42C4NT1P
-LH42C4PT1P



●SAFETY PRECAUTIONS●

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.
The precautions given in this manual are concerned with this product only. For the safety precautions of the programmable controller system, refer to the user's manual for the CPU module used.

In this manual, the safety precautions are classified into two levels: "⚠WARNING" and "⚠CAUTION".

⚠WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠CAUTION" may lead to serious consequences.
Observe the precautions of both levels because they are important for personal and system safety.
Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

⚠WARNING

- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
  (1) Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured external to the programmable controller.
  (2) When the programmable controller detects an abnormal condition, it stops the operation and all outputs are:
    • Turned off if the overcurrent or overvoltage protection of the power supply module is activated.
    • Held or turned off according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.

  Also, all outputs may be turned on if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the programmable controller. For a fail-safe circuit example, refer to the "GENERAL SAFETY REQUIREMENTS" chapter in the Safety Guidelines included with the CPU module or head module.
  (3) Outputs may remain on or off due to a failure of a component such as a transistor in an output circuit. Configure an external circuit for monitoring output signals that could cause a serious accident.
- In an output circuit, when a load current exceeding the rated current or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.
- For the operating status of each station after a communication failure, refer to relevant manuals for each network. Failure to do so may result in an accident due to an incorrect output or malfunction.
- When changing data from a peripheral device connected to the CPU module to the running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.

[Design Precautions]

⚠CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
- During control of an inductive load such as a lamp, heater, or solenoid valve, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Therefore, use a module that has a sufficient current rating.
- After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size. Design circuits so that the entire system will always operate safely, regardless of the time.

[Installation Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before mounting or removing a module. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Installation Precautions]

⚠CAUTION

- Use the programmable controller in an environment that meets the general specifications in the Safety Guidelines provided with the CPU module or head module. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- To interconnect modules, engage the respective connectors and securely lock the module joint levers until they click. Incorrect interconnection may cause malfunction, failure, or drop of the module.
- Do not directly touch any conductive parts and electronic components of the module. Doing so can cause malfunction or failure of the module.

[Wiring Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before wiring. Failure to do so may result in electric shock or cause the module to fail or malfunction.
- After installation and wiring, attach the included terminal cover to the module before turning it on for operation. Failure to do so may result in electric shock.

[Wiring Precautions]

⚠CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction.
- Use applicable solderless terminals and tighten them within the specified torque range.
  If any spade solderless terminal is used, it may be disconnected when a terminal block screw comes loose, resulting in failure.
- Check the rated voltage and terminal layout before wiring to the module, and connect the cables correctly.
  Connecting a power supply with a different voltage rating or incorrect wiring may cause a fire or failure.
- Connectors for external devices must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
- Securely connect the connector to the module.
- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
- Tighten the terminal block screws within the specified torque range. Undertightening can cause short circuit, fire, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, fire, or malfunction.
- When disconnecting the cable from the module, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable.
  For the cable connected to the terminal block, loosen the terminal screw.
  Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
- Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
- A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
- Mitsubishi programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block.
  Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock.
  For wiring methods, refer to the MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection).

[Startup and Maintenance Precautions]

⚠WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
- Correctly connect the battery connector. Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire. Also, do not expose it to liquid or strong shock.
  Doing so will cause the battery to produce heat, explode, ignite, or leak, resulting in injury and fire.
- Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal block screws or connector screws. Failure to do so may result in electric shock.

[Startup and Maintenance Precautions]

⚠CAUTION

- Before performing online operations (especially, program modification, forced output, and operating status change) for the running CPU module from the peripheral device connected, read relevant manuals carefully and ensure the safety. Improper operation may damage machines or cause accidents.
- Do not disassemble or modify the module. Doing so may cause failure, malfunction, injury, or a fire.
- Use any radio communication device such as a cellular phone or PHS (Personal Handy-phone System) more than 25cm away in all directions from the programmable controller. Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing a module. Failure to do so may cause the module to fail or malfunction.
- Tighten the terminal block screws or connector screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- After the first use of the product (module, display unit, and terminal block), do not connect/disconnect the product more than 50 times (in accordance with IEC 61131-2). Exceeding the limit may cause malfunction.
- Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.

[Disposal Precautions]

⚠CAUTION

- When disposing of this product, treat it as industrial waste.

●CONDITIONS OF USE FOR THE PRODUCT●

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.
MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.
("Prohibited Application")
Prohibited Applications include, but not limited to, the use of the PRODUCT in;
- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTs are required. For details, please contact the Mitsubishi representative in your region.

INTRODUCTION

Thank you for purchasing the Mitsubishi MELSEC-L series programmable controllers.
This manual describes safety precautions, specifications, and functions.
Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC-L series programmable controller to handle the product correctly.

Remark

Operating procedures are explained using GX Works2.
When using GX Developer, refer to the following.
Page 90, Appendix 4

COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

(1) Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.

- MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)
- MELSEC-L CC-Link IE Field Network Head Module User's Manual
- Safety Guidelines (This manual is included with the CPU module or head module.)

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

(2) Additional measures

No additional measures are necessary for the compliance of this product with EMC and Low Voltage Directives.

RELEVANT MANUALS

(1) CPU module user's manual

Manual name manual number (model code)	Description
MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) SH-080890ENG, 13JZ36	Specifications of the CPU modules, power supply modules, display unit, branch module, extension module, SD memory cards, and batteries, information on how to establish a system, maintenance and inspection, and troubleshooting

(2) Head module User's Manual

Manual name manual number (model code)	Description
MELSEC-L CC-Link IE Field Network Head Module User's Manual SH-080919ENG, 13JZ48	Specifications, procedures before operation, system configuration, installation, wiring, settings, and troubleshooting of the head module
MELSEC-L SSCNET III/H Head Module User's Manual SH-081152ENG, 13JZ78	Specifications, procedures before operation, system configuration, installation, wiring, settings, and troubleshooting of the head module

(3) Operating manual

Manual name manual number (model code)	Description
GX Works2 Version 1 Operating Manual (Common) SH-080779ENG, 13JU63	System configuration, parameter settings, and online operations of GX Works2, which are common to Simple projects and Structured projects
GX Developer Version 8 Operating Manual SH-080373E, 13JU41	Operating methods of GX Developer, such as programming, printing, monitoring, and debugging

(4) User's manual for optional items

Manual name manual number (model code)	Description
Relay Terminal Module User's Manual (Hardware) A6TE2-16SRN IB-66833, 13JL53	Specifications and part names of the A6TE2-16SRN

CONTENTS

SAFETY PRECAUTIONS 1
CONDITIONS OF USE FOR THE PRODUCT 6
INTRODUCTION 7
COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES 8
RELEVANT MANUALS 9
MANUAL PAGE ORGANIZATION 12
TERMS 14
PACKING LIST 14

CHAPTER 1 PRODUCT LINEUP 15

1.1 Product Lineup 15
1.2 How to Read the Model Name 16

CHAPTER 2 PART NAMES 18

CHAPTER 3 BEFORE USING I/O MODULE 20

3.1 Input Module 20
3.2 Output Module 21
3.3 I/O Combined Module 27

CHAPTER 4 SPECIFICATIONS 28

4.1 General Specifications 28
4.2 Input Module Specifications 29
4.2.1 LX10 AC input module 29
4.2.2 LX28 AC input module 31
4.2.3 LX40C6 DC input module 32
4.2.4 LX41C4 DC input module 34
4.2.5 LX42C4 DC input module 36
4.3 Output Module Specifications 38
4.3.1 LY10R2 contact output module 39
4.3.2 LY18R2A contact output module (All points independent) 40
4.3.3 LY20S6 triac output module 41
4.3.4 LY28S1A triac output module (All points independent) 42
4.3.5 LY40NT5P transistor output module (Sink type) 44
4.3.6 LY41NT1P transistor output module (Sink type) 45
4.3.7 LY42NT1P transistor output module (Sink type) 47
4.3.8 LY40PT5P transistor output module (Source type) 49
4.3.9 LY41PT1P transistor output module (Source type) 50
4.3.10 LY42PT1P transistor output module (Source type) 52
4.4 I/O Combined Module Specifications 53
4.4.1 LH42C4NT1P DC input/transistor output combined module (Sink type) 54
4.4.2 LH42C4PT1P DC input/transistor output combined module (Source type) 56

CHAPTER 5 SYSTEM CONFIGURATION 58

CHAPTER 6 INSTALLATION AND WIRING 61

6.1 Installation Environment and Installation Position 61
6.2 Wiring 62
6.2.1 For the 18-point screw terminal block module 62
6.2.2 For the 40-pin connector type module 64
6.3 Input Wiring Examples 66

CHAPTER 7 VARIOUS SETTINGS 68

7.1 Input Response Time Setting 68
7.2 Error Time Output Mode Setting 70

CHAPTER 8 TROUBLESHOOTING 71

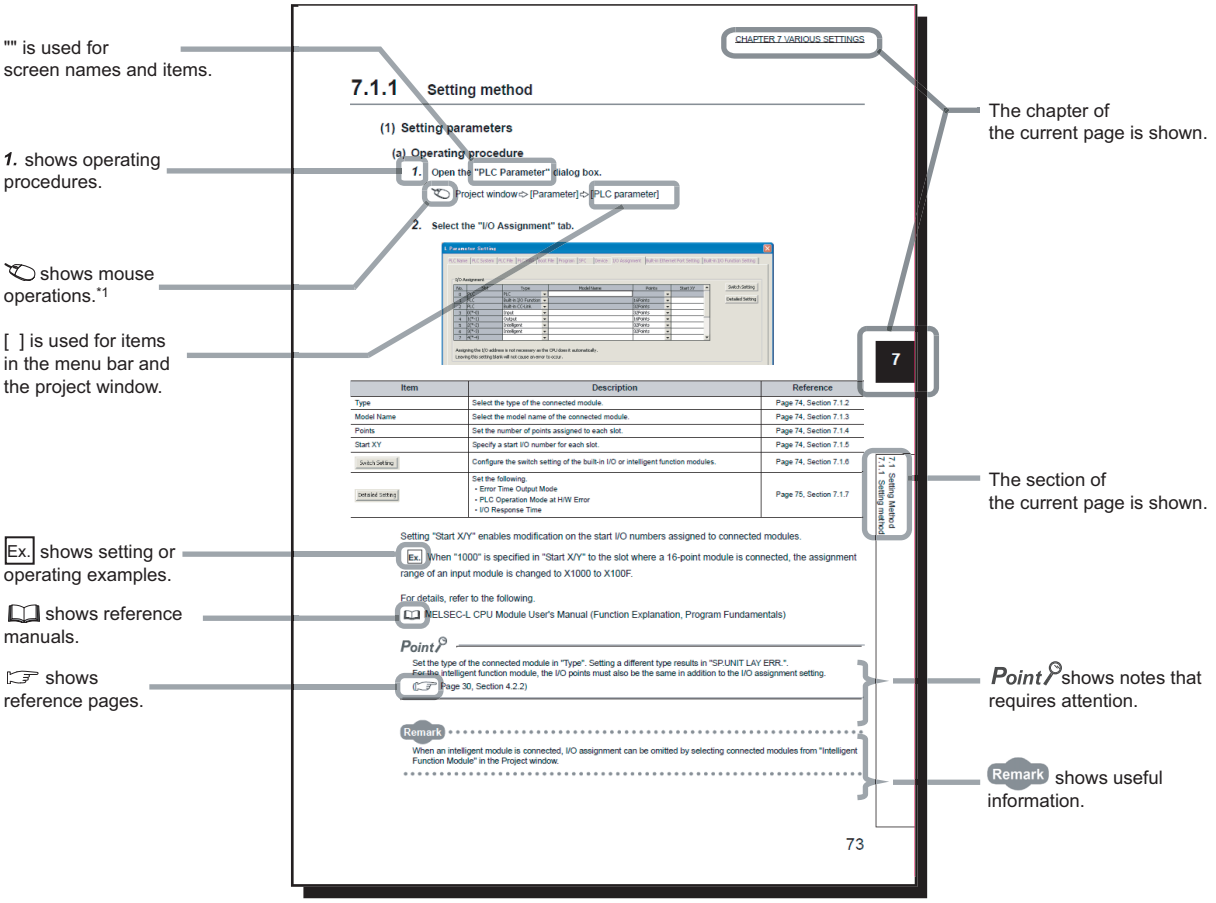
8.1 Troubleshooting for Input Circuit 71
8.2 Troubleshooting for Output Circuit 75

APPENDICES 81

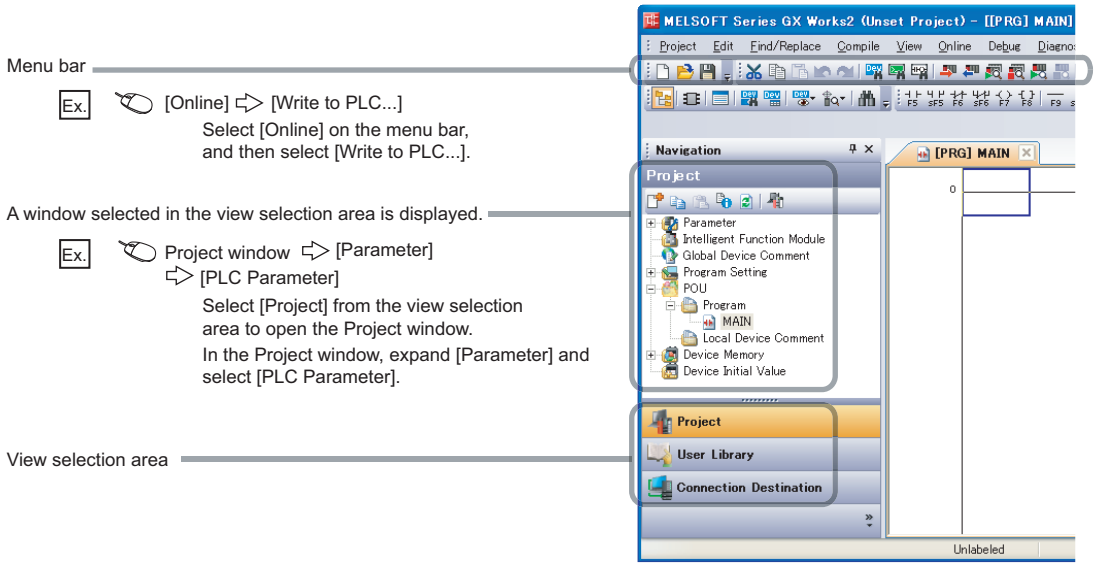
Appendix 1 Optional Items 81
Appendix 1.1 Connector/terminal block converter modules 81
Appendix 1.2 Relay terminal module (A6TE2-16SRN) 86
Appendix 1.3 Dedicated cables with connector 87
Appendix 1.4 Converter modules and interface modules (FA goods) 87
Appendix 2 Checking Serial Number 88
Appendix 3 Compatibility of L series and Q series I/O module 89
Appendix 4 When Using GX Developer 90
Appendix 5 External Dimensions 91
Appendix 5.1 I/O modules 91
Appendix 5.2 Connectors 93
Appendix 5.3 Connector/terminal block converter modules 94
Appendix 5.4 Cable for connector/terminal block converter module 95
REVISIONS 96
WARRANTY 97
TRADEMARKS 98

MANUAL PAGE ORGANIZATION

In this manual, pages are organized and the symbols are used as shown below.
The following illustration is for explanation purpose only, and should not be referred to as an actual documentation.

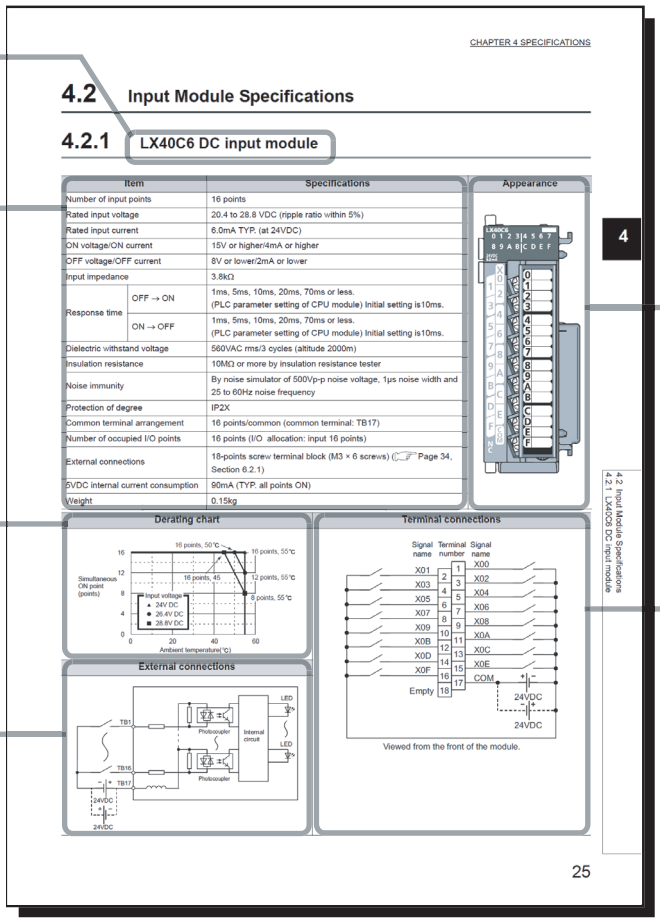


*1 The mouse operation example is provided below. (For GX Works2)



Pages describing specifications are organized as shown below.

The following illustration is for explanation purpose only, and should not be referred to as an actual documentation.



Model name and module name

Module specifications

Derating chart (only for input modules)

External connections

Appearance

Terminal connections

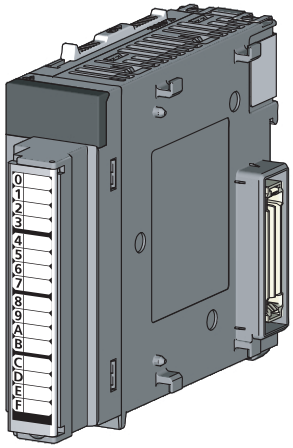
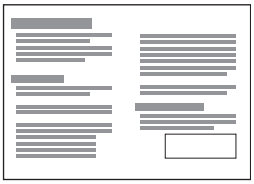
TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
CPU module	Abbreviation for the MELSEC-L series CPU module
Power supply module	Abbreviation for the MELSEC-L series power supply module
Display unit	A liquid crystal display to be attached to the CPU module
LCPU	Another term for the MELSEC-L series CPU module
GX Works2	The product name of the software package for the MELSEC programmable controllers
GX Developer	
L series I/O module	Abbreviation for the MELSEC-L series I/O module
Q series I/O module	Abbreviation for the MELSEC-Q series I/O module
I/O module	Another term for the MELSEC-L series I/O module
AC□□TB	Abbreviation for the AC05TB, AC10TB, AC20TB, AC30TB, AC50TB, AC80TB, and AC100TB
AC□□TE	Abbreviation for the AC06TE, AC10TE, AC30TE, AC50TE, and AC100TE

PACKING LIST

The following items are included in the package of this product. Before use, check that all the items are included.

I/O module	
	
Module	Before Using the Product

CHAPTER 1 PRODUCT LINEUP

1.1 Product Lineup

(1) Input module

Module name	Input specifications	Number of occupied I/O points	Current consumption	Weight	Model name	Reference
AC Input module	Terminal block 100 to 120VAC, 16 points	16 points	90mA	0.17kg	LX10	Page 29, Section 4.2.1
	Terminal block 100 to 240VAC, 8 points	16 points	80mA	0.15kg	LX28	Page 31, Section 4.2.2
DC Input module	Terminal block 24VDC, 16 points	16 points	90mA	0.15kg	LX40C6	Page 32, Section 4.2.3
	40-pin connector 24VDC, 32 points	32 points	100mA	0.11kg	LX41C4	Page 34, Section 4.2.4
	40-pin connector (× 2) 24VDC, 64 points	64 points	120mA	0.12kg	LX42C4	Page 36, Section 4.2.5

(2) Output module

Module name		Output specifications	Number of occupied I/O points	Current consumption	Weight	Model name	Reference
Contact output module		Terminal block 240VAC/24VDC, 2A/1 point, 16 points	16 points	460mA	0.21kg	LY10R2	Page 39, Section 4.3.1
		Terminal block 240VAC/24VDC, 2A/1 point, 8 points All points independent	16 points	260mA	0.14kg	LY18R2A	Page 40, Section 4.3.2
Triac output module		Terminal block 100 to 240VAC, 0.6A/1 point, 16 points	16 points	300mA	0.22kg	LY20S6	Page 41, Section 4.3.3
		Terminal block 100 to 240VAC, 1A/1 point, 8 points All points independent	16 points	200mA	0.15kg	LY28S1A	Page 42, Section 4.3.4
Transistor output module	Sink type	Terminal block 12 to 24VDC, 0.5A/1 point, 16 points	16 points	100mA	0.15kg	LY40NT5P	Page 44, Section 4.3.5
		40-pin connector 12 to 24VDC, 0.1A/1 point, 32 points	32 points	140mA	0.11kg	LY41NT1P	Page 45, Section 4.3.6
		40-pin connector (× 2) 12 to 24VDC, 0.1A/1 point, 64 points	64 points	190mA	0.12kg	LY42NT1P	Page 47, Section 4.3.7
	Source type	Terminal block 12 to 24VDC, 0.5A/1 point, 16 points	16 points	100mA	0.15kg	LY40PT5P	Page 49, Section 4.3.8
		40-pin connector 12 to 24VDC, 0.1A/1 point, 32 points	32 points	140mA	0.11kg	LY41PT1P	Page 50, Section 4.3.9
		40-pin connector (× 2) 12 to 24VDC, 0.1A/1 point, 64 points	64 points	190mA	0.12kg	LY42PT1P	Page 52, Section 4.3.10

(3) I/O combined module

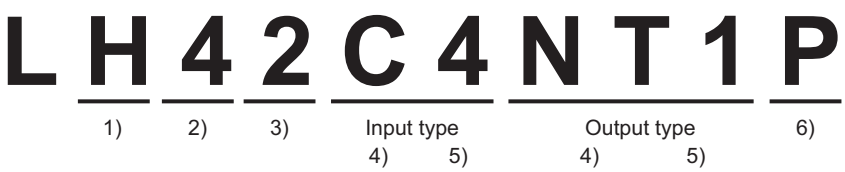
Module name		Input specifications	Output specifications	Number of occupied I/O points	Current consumption	Weight	Model name	Reference
DC input/transistor output combined module	Sink type	40-pin connector 24VDC, 32 points	40-pin connector 12 to 24VDC, 0.1A/1 point, 32 points	32 points	160mA	0.12kg	LH42C4NT1P	Page 54, Section 4.4.1
	Source type			32 points	150mA	0.12kg	LH42C4PT1P	Page 56, Section 4.4.2

1.2 How to Read the Model Name

- For input module or output module



- For I/O combined module



No.	Item	Symbol	Specifications
1)	Module type	X	Input
		Y	Output
		H	I/O combined

No.	Item	Symbol	Specifications				
			Input module		Output module		
			AC input	DC input	Contact output	Triac output	Transistor output
2)	Voltage specification	1	100 to 120VAC	-	24VDC/240VAC	-	-
		2	100 to 240VAC	-	-	100 to 240VAC	-
		4	-	24VDC	-	-	12 to 24VDC

No.	Item	Symbol	Specifications
3)	Number of I/O points	0	16 points
		1	32 points
		2	64 points
		8	8 points

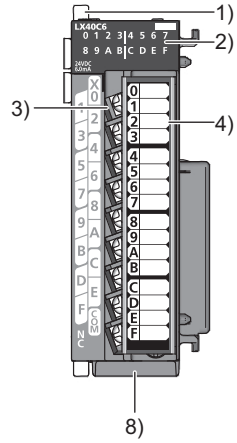
No.	Item	Symbol	Specifications
4)	I/O type	Blank	AC input
		C	DC input (positive/negative common available)
		NT	Transistor output (sink type)
		PT	Transistor output (source type)
		R	Contact output
		S	Triac output

No.	Item	Symbol	Specifications				
			Input module		Output module		
			AC input	DC input	Contact output	Triac output	Transistor output
5)	Current specifications	1	-	-	-	1A	0.1A
		2	-	-	2A	-	-
		4	-	4mA	-	-	-
		5	-	-	-	-	0.5A
		6	-	6mA	-	0.6A	-

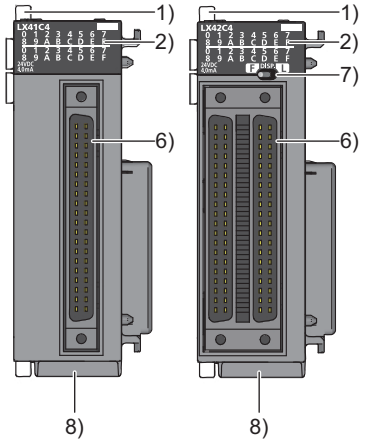
No.	Item	Symbol	Specifications
6)	Extended specification	P	With protection function
		A	Independent common

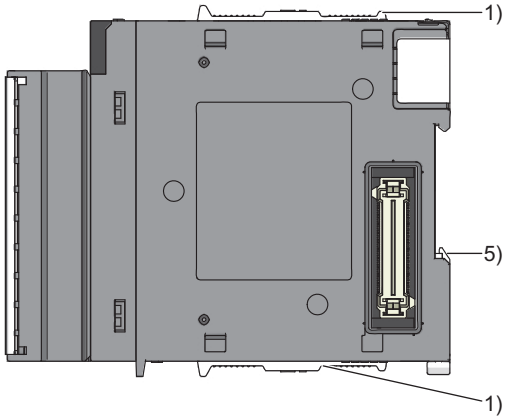
CHAPTER 2 PART NAMES

18-point screw terminal block type



40-pin connector type





No.	Name	Description
1)	Module joint levers	Levers for connecting two modules
2)	I/O operation status indicator LEDs	Indicate the I/O status. • On (green): I/O signal is on. • Off: I/O signal is off.
3)	Terminal block	A 18-point terminal block for connecting I/O signal cables to external devices
4)	Terminal cover	A cover for preventing electric shock A label on it is used for recording the signal names of devices allocated to terminals.
5)	DIN rail hook	A hook used to mount the module to a DIN rail
6)	Connectors for external devices (40 pins)	A connector for connecting I/O signal cables to external devices.
7)	Indication selector switch*1	• For input module or output module: Used to switch the LED indications between the first-half 32 points and latter-half 32 points of a 64-point module. • For I/O combined module: Used to switch the LED indications between input and output.
8)	Serial number display	Displays the serial number printed on the rating plate.

*1 Operate the Indication selector switch with your fingers. Do not use a screwdriver or similar tool as it may damage the switch.

Memo

CHAPTER 3 BEFORE USING I/O MODULE

3.1 Input Module

(1) Common precautions for all output modules

(a) Simultaneous on points

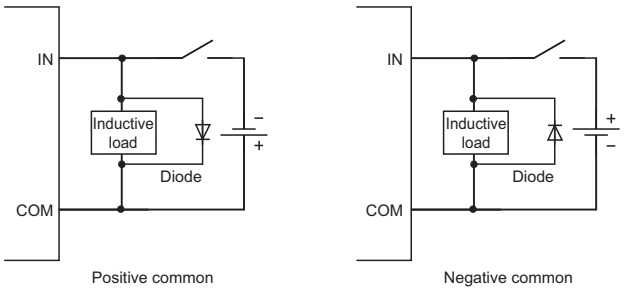
The number of simultaneous on points of input module depends on the input voltage and ambient temperature.
Refer to the derating chart of the input module specifications. (☞Page 28, CHAPTER 4)

(2) Precautions for using the DC input module

(a) Measures against back EMF

When an inductive load is connected, connect a diode in parallel with the load.
Use a diode that meets the following conditions.

- Reverse breakdown voltage is equal to or more than 10 times as large as the circuit voltage.
- Forward current is equal to or more than 2 times as large as the load current.



3.2 Output Module

(1) Common precautions for all output modules

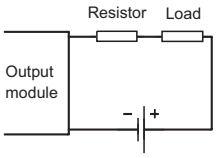
(a) Maximum switching frequency when the module drives Inductive load.

The output must be on for one second or longer and off for one second or longer.

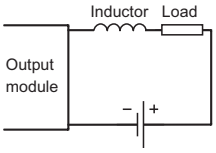
(b) Load for connection

When connecting a counter or timer that has a DC-DC converter as a load, select an output module whose maximum load current is larger than inrush current of the load.
Selecting an output module by average current of the load may cause a failure of the module because inrush current flows at a constant frequency at power-on or during operation due to the connected load.
If an output module needs to be selected by average current of the load, take either of the following actions to reduce an influence from inrush current.

- Connecting a resistor to the load in series



- Connecting an inductor to the load in series



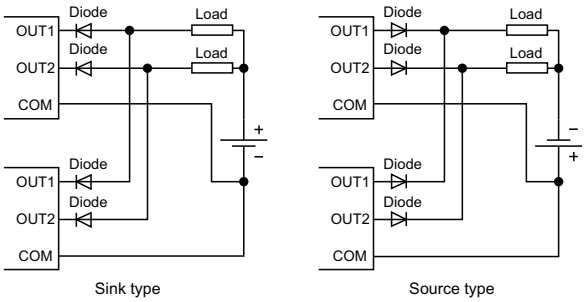
(2) Precaution for using the transistor output module

(a) Action against reverse current

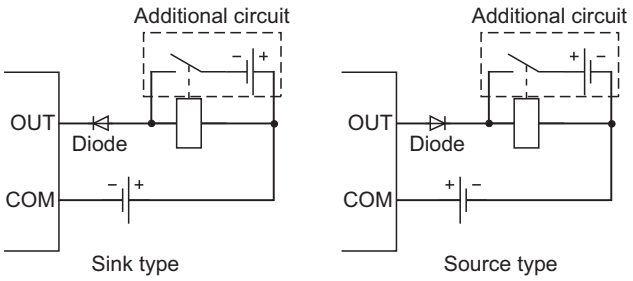
If a transistor output module is wired as shown below, reverse current flows in an output element, causing a failure of the element.

When wiring a transistor output module, connect a diode as shown below.

- When connecting transistor output modules in parallel



- When incorporating an additional circuit parallel to a transistor output module

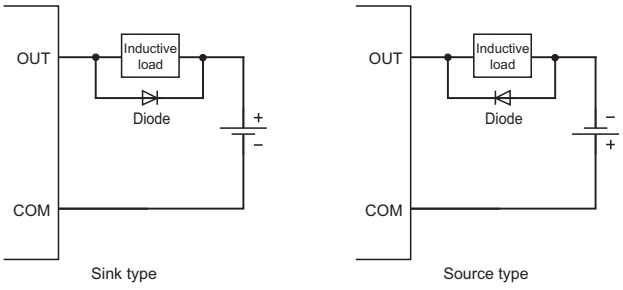


(b) Measures against back EMF

When an inductive load is connected, connect a diode in parallel with the load.

Use a diode that meets the following conditions.

- Reverse breakdown voltage is equal to or more than 10 times as large as the circuit voltage.
- Forward current is equal to or more than 2 times as large as the load current.



(3) Precautions for using the contact output module

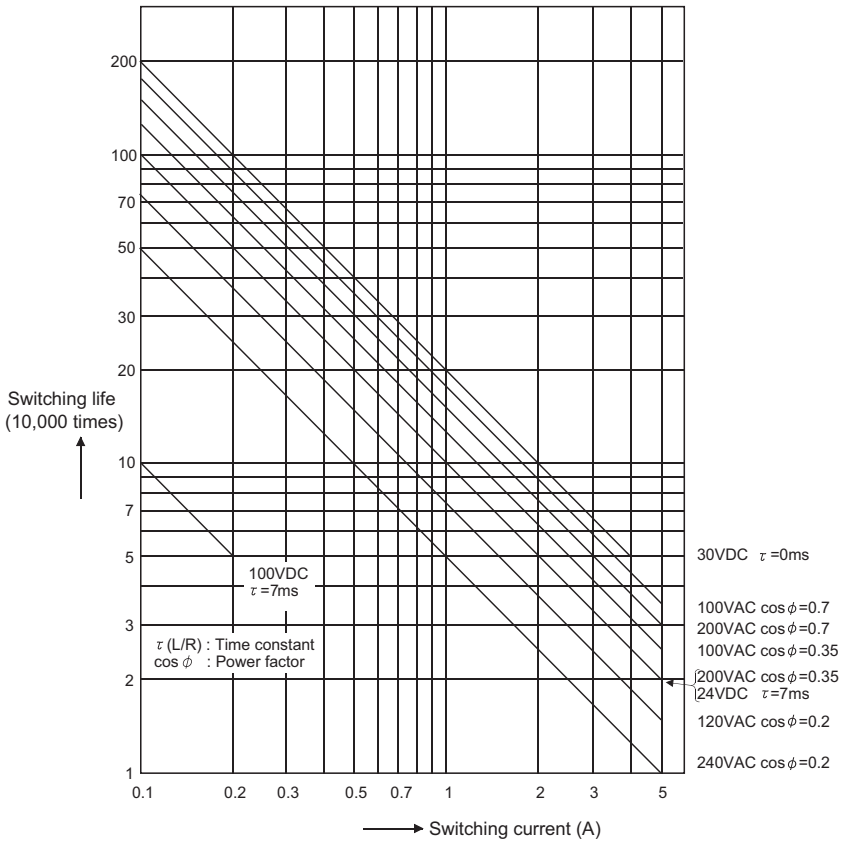
When using the contact output module, consider the following.

- Relay life (contact switching life)
- Effects to relay life due to connected load
- Measures against back EMF

(a) Relay life (contact switching life)

Applicable module · · · · · LY10R2, LY18R2A

The relay life depends on the operating environment. Select a module according to the operating environment. The relay lives shown below are the actual service values, not the guaranteed values. Replace the module well in advance since the actual switching life may be shorter than the one shown below.



Operating environment	Switching life
Rated switching voltage/current, rated load	100 thousand times
200VAC 1.5A, 240VAC 1A (COSϕ = 0.7)	100 thousand times
200VAC 0.4A, 240VAC 0.3A (COSϕ = 0.7)	300 thousand times
200VAC 1A, 240VAC 0.5A (COSϕ = 0.35)	100 thousand times
200VAC 0.3A, 240VAC 0.15A (COSϕ = 0.35)	300 thousand times
24VDC 1A, 100VDC 0.1A (L/R = 7ms)	100 thousand times
24VDC 0.3A, 100VDC 0.03A (L/R = 7ms)	300 thousand times

(b) Effects to relay life due to connected load

The actual relay life may be significantly shortened compared to the relay life curve, depending on the type of a load connected and the characteristics of inrush current. (☞Page 23, Section 3.2 (3) (a)) Also, the inrush current may cause the module contact welding.

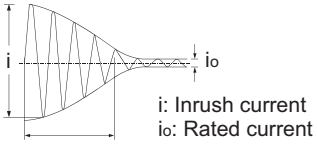
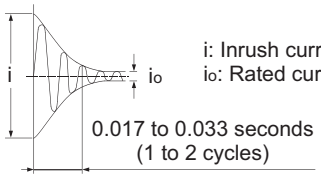
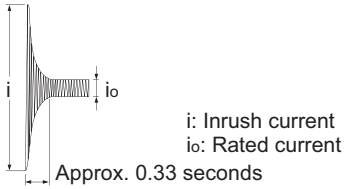
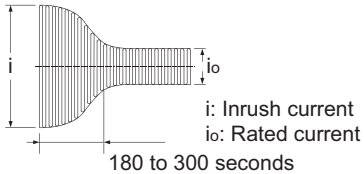
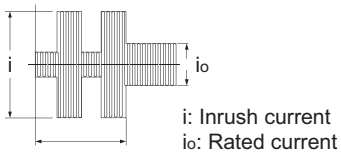
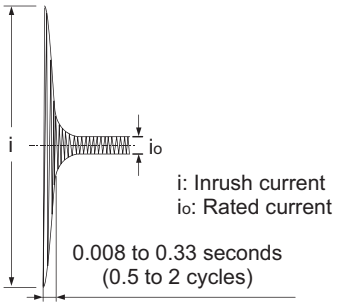
Take the following measures to prevent shortening of the relay life and the contact welding.

- Select a load so that the inrush current will be within the rated current of the module.
- Connect an external relay that can withstand the inrush current.

The following table shows the relation between the road and the inrush current.

Select a load so that the inrush current (i) and the rated current (io) will be within the rated switching current specified for the output module used.

The inrush current may flow for a longer time depending on the load.

Load type	Signal waveform diagram	Inrush current (i)/rated current (io)	Signal waveform diagram	Inrush current (i)/rated current (io)
Inductive load	Load of a solenoid  0.07 to 0.1 seconds	Approx. 10 to 20 times	Load of an electromagnetic contactor  0.017 to 0.033 seconds (1 to 2 cycles)	Approx. 3 to 10 times
Lamp load	Load of an incandescent bulb  Approx. 0.33 seconds	Approx. 3 to 10 times	Load of a mercury lamp  180 to 300 seconds (3 to 5 minutes)	Approx. 3 times*1
	Load of a fluorescent  Within 10 seconds	Approx. 5 to 10 times	—	—
Capacitive load	Capacitive load*2  0.008 to 0.33 seconds (0.5 to 2 cycles)	Approx. 20 to 40 times	—	—

*1 Typical electric-discharge lamp circuit includes discharge tubes, transformers, choke coils, and capacitors. Therefore, note that the inrush current may flow 20 to 40 times as large as the rated current in the case of high power factor and low power impedance.

*2 When the wiring of the circuit is long, take care of the wire capacity.

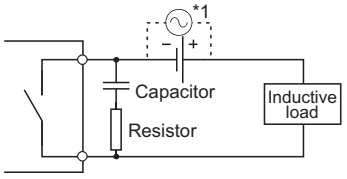
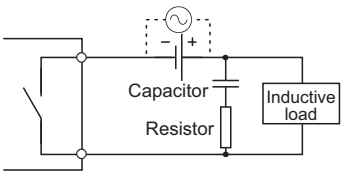
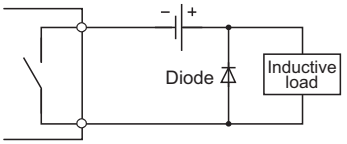
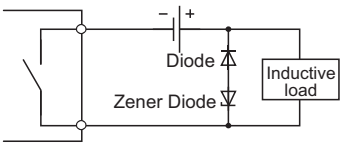
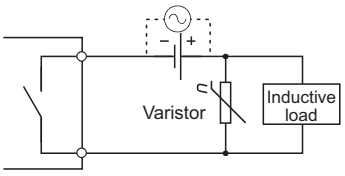
(c) Measures against back EMF

Configure a contact protection circuit for extending the contact life, preventing noise when the contact is cut off, and suppressing the generation of carbide and nitric acid due to arc discharge.

An Incorrect contact protection circuit may cause contact welding.

Also, when using the contact protection circuit, the recovery time may be long.

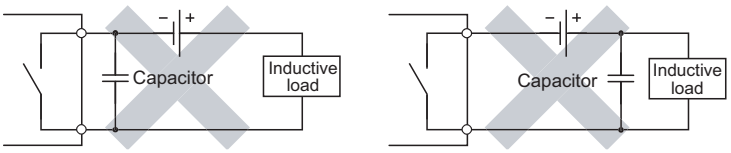
The following table shows the representative examples of the contact protection circuit.

Example		Method for selecting elements	Remarks
Capacitor + Resistor method (CR method)	 	Refer to the following for constants of the capacitor and resistor. Note that the following values may differ depending on a nature of the load and a variation of characteristics of it. • Capacitor: 0.5 to 1(μF) against load current of 1A • Resistor: 0.5 to 1(Ω) against power supply voltage of 1V Use a capacitor whose withstand voltage is equal to or more than the rated voltage. In AC circuit, use a capacitor having no polarity.	If a load is a relay or solenoid, the recovery time delays. A capacitor suppresses electric discharge while a contact is off, and a resistor restricts a flow of current while a contact is on.
Diode method		Use a diode that meets both conditions shown below. • Reverse breakdown voltage is equal to or more than 10 times as large as the circuit voltage. • The forward current is equal to or more than 2 times as large as the load current.	The recovery time is slower than the CR method.
Diode + Zener diode method		Use zener voltage for the zener diode equal to or more than the power supply voltage.	This method is effective when the recovery time delays considerably by the diode method.
Varistor method		Select a cut voltage (Vc) for the varistor to meet the following condition. • Vc > Power voltage × 1.5(V) • Vc > Power supply voltage × 1.5(V) × √2 (when using AC power supply) This method is not effective when the Vc is too high	The recovery time delays slightly.

*1 When using AC power, impedance of CR must be larger enough than it of the load (prevention of a malfunction due to leak current from the CR).

Point

- Avoid providing a contact protection circuits shown below.
  These circuit are effective for preventing an arc at shut-off. However, the contact welding may occur because the charge current flows to capacitor when the contact turns on or off.
  A DC inductive load is usually harder for switching than a resistor load, but if a proper protection circuit is configured, the performance will be similar to the resistor load.



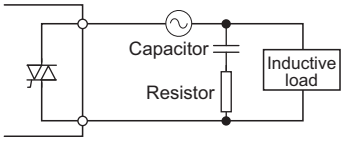
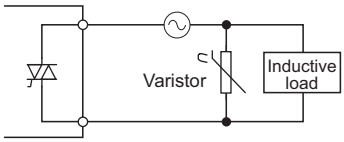
- A protection circuit must be provided closely to a load or contact (module). If their distance is far, the protection circuit may not be effective. Appropriate distance is within 50 cm.

(4) Precautions for using the triac output module

(a) Measures against back EMF

Take measures against back EMF to the side where the load is connected if the wiring distance from the output module to the load is long.

If not, the surge suppressor in the output module may not work effectively.

Example		Method for selecting elements	Remarks
Capacitor + Resistor method (CR method)		Refer to the following for constants of the capacitor and resistor. Note that the following values may differ depending on a nature of the load and a variation of characteristics of it. • Capacitor: 0.5 to 1(μF) against load current of 1A • Resistor: 0.5 to 1(Ω) against power supply voltage of 1V Use a capacitor whose withstand voltage is equal to or more than the rated voltage. Use a capacitor having no polarity.	If a load is a relay or solenoid, the recovery time delays.
Varistor method		Select a cut-off voltage (Vc) for the varistor to meet the following condition. • Vc > Power supply voltage × 1.5(V) × √2 This method is not effective when the Vc is too high.	The recovery time delays slightly.

3.3 I/O Combined Module

This section describes the precautions for using the I/O combined module.

The precautions not described below are common to that for the input module and output module. (☞ Page 20, Section 3.1, Page 21, Section 3.2)

(1) I/O numbers of the I/O combined module

The I/O combined module uses same I/O number for input and output.

Because same number is used for input and output, the I/O numbers to be used can be saved.

Input (X)	Output (Y)	
X00 ⋮ X1F	Y00 ⋮ Y1F	32 points

(2) Applicable software

Use GX Works2 with version 1.492N or later.

The following cannot be set using GX Developer and GX Works2 whose version is earlier than 1.492N.

- "I/O Mix" cannot be selected in I/O Assignment.
- Input response time cannot be set.
- Error Time Output Mode cannot be set.

CHAPTER 4 SPECIFICATIONS

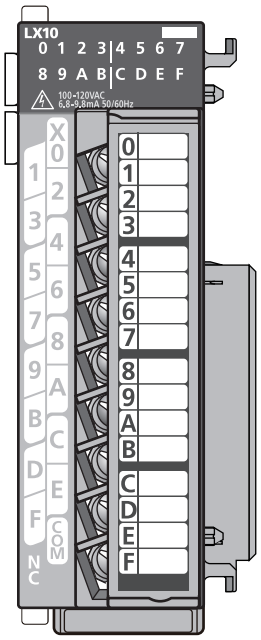
4.1 General Specifications

For the general specifications of the I/O modules, refer to the following manual.

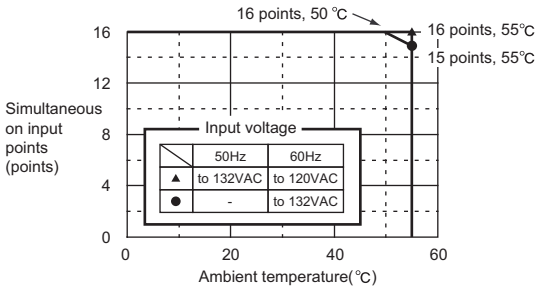
Manual "Safety Guidelines" included in the CPU module or head module

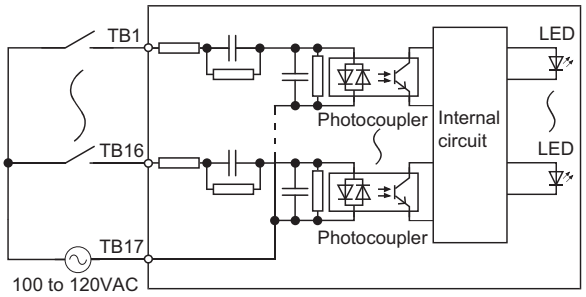
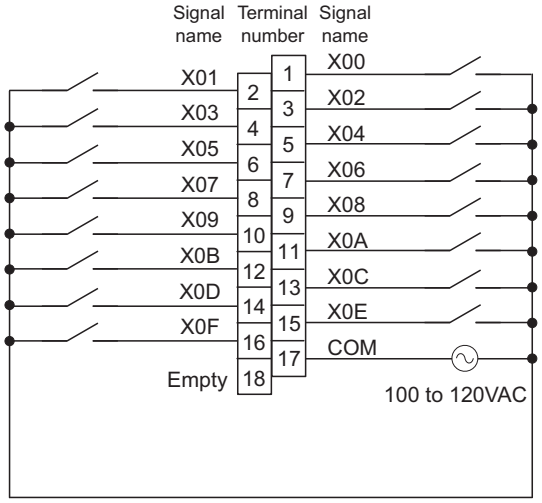
4.2 Input Module Specifications

4.2.1 LX10 AC input module

Item		Specifications	Appearance
Number of input points		16 points	
Rated input voltage, frequency		100 to 120VAC (+10%/-15%), 50/60Hz(±3Hz)	
Input voltage distortion		Within 5%	
Rated input current		8.2mA (100VAC, 60Hz), 6.8mA (100VAC, 50Hz)	
Inrush current		Max. 200mA within 1ms	
ON voltage/ON current		80VAC or higher/5mA or higher (50Hz, 60Hz)	
OFF voltage/OFF current		30VAC or lower/1.7mA or lower (50Hz, 60Hz)	
Input resistance		12.2kΩ (60Hz), 14.6kΩ (50Hz)	
Response time	OFF to ON	15ms or less (100VAC 50Hz, 60Hz)	
	ON to OFF	20ms or less (100VAC 50Hz, 60Hz)	
Dielectric withstand voltage		1400VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP1X	
Common terminal arrangement		16 points/common (common terminal: TB17)	
Number of occupied I/O points		16 points (I/O assignment: input 16 points)	
External interface		18-point screw terminal block (M3 × 6 screws) (☞ Page 62, Section 6.2.1)	
5VDC internal current consumption		90mA (TYP. all points ON)	
Weight		0.17kg	

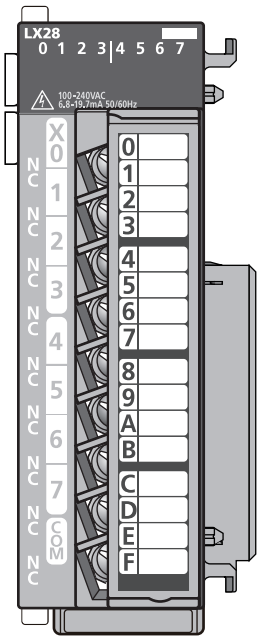
Derating chart



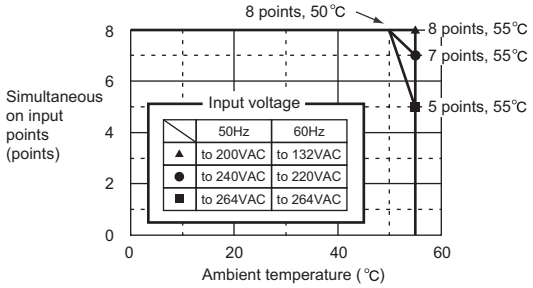
External connections	Terminal connections
	

Viewed from the front of the module.

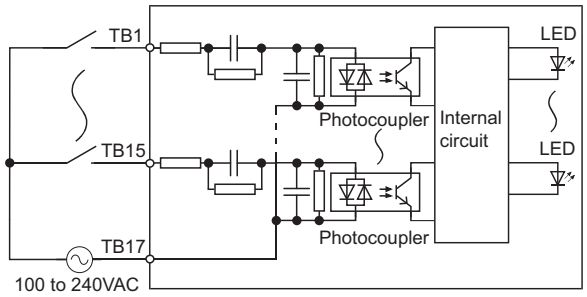
4.2.2 LX28 AC input module

Item		Specifications	Appearance
Number of input points		8 points	
Rated input voltage, frequency		100 to 240VAC (+10%/-15%), 50/60Hz(±3Hz)	
Input voltage distortion		Within 5%	
Rated input current		16.4mA (200VAC, 60Hz), 13.7mA (200VAC, 50Hz) 8.2mA (100VAC, 60Hz), 6.8mA (100VAC, 50Hz)	
Inrush current		Max. 950mA within 1ms	
ON voltage/ON current		80VAC or higher/5mA or higher (50Hz, 60Hz)	
OFF voltage/OFF current		30VAC or lower/1.7mA or lower (50Hz, 60Hz)	
Input resistance		12.2kΩ (60Hz), 14.6kΩ (50Hz)	
Response time	OFF to ON	15ms or less (100VAC 50Hz, 60Hz) 10ms or less (200VAC 50Hz, 60Hz)	
	ON to OFF	20ms or less (100/200VAC 50Hz, 60Hz)	
Dielectric withstand voltage		2300VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP1X	
Common terminal arrangement		8 points/common (common terminal: TB17)	
Number of occupied I/O points		16 points (I/O assignment: input 16 points)	
External interface		18-point screw terminal block (M3 × 6 screws) (☞ Page 62, Section 6.2.1)	
5VDC internal current consumption		80mA (TYP. all points ON)	
Weight		0.15kg	

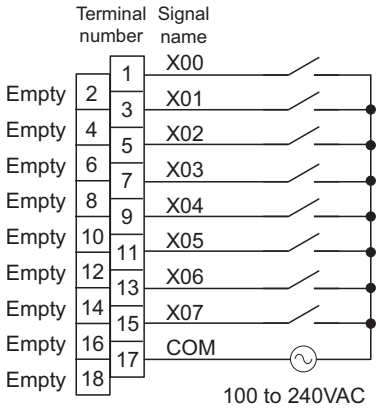
Derating chart



External connections

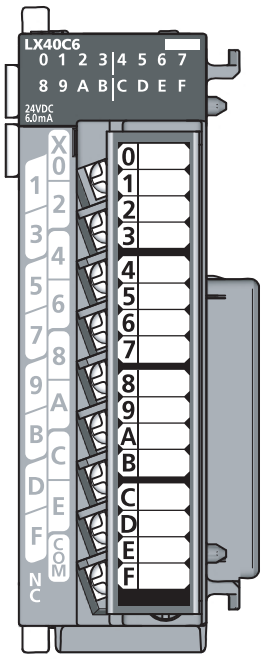


Terminal connections

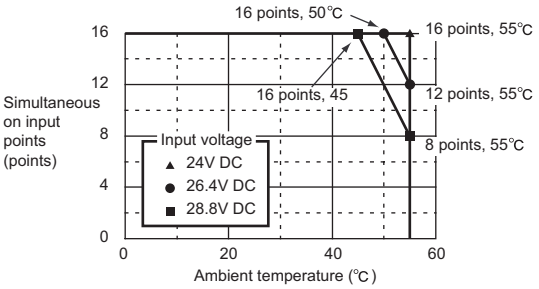


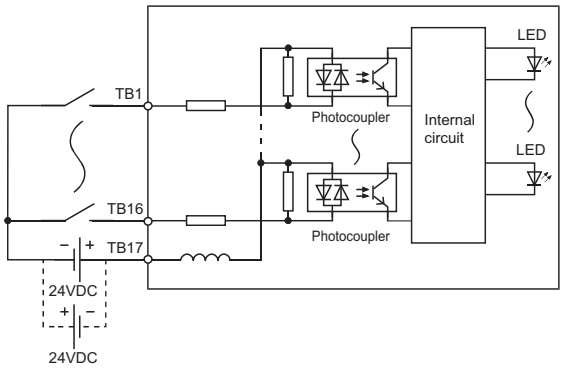
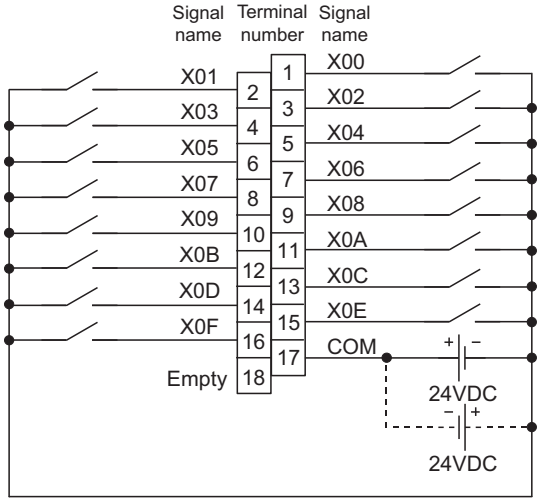
Viewed from the front of the module.

4.2.3 LX40C6 DC input module

Item		Specifications	Appearance
Number of input points		16 points	
Rated input voltage		24VDC (ripple rate: 5% or less) (Allowable voltage range: 20.4 to 28.8VDC)	
Rated input current		6.0mA TYP. (at 24VDC)	
ON voltage/ON current		15V or higher/4mA or higher	
OFF voltage/OFF current		8V or lower/2mA or lower	
Input resistance		3.8kΩ	
Response time	OFF to ON	1ms, 5ms, 10ms, 20ms, 70ms or less (PLC parameter setting of CPU module) Initial setting is 10ms.	
	ON to OFF	1ms, 5ms, 10ms, 20ms, 70ms or less (PLC parameter setting of CPU module) Initial setting is 10ms.	
Dielectric withstand voltage		510VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP2X	
Common terminal arrangement		16 points/common (common terminal: TB17)	
Number of occupied I/O points		16 points (I/O assignment: input 16 points)	
External interface		18-point screw terminal block (M3 × 6 screws) (☞ Page 62, Section 6.2.1)	
5VDC internal current consumption		90mA (TYP. all points ON)	
Weight		0.15kg	

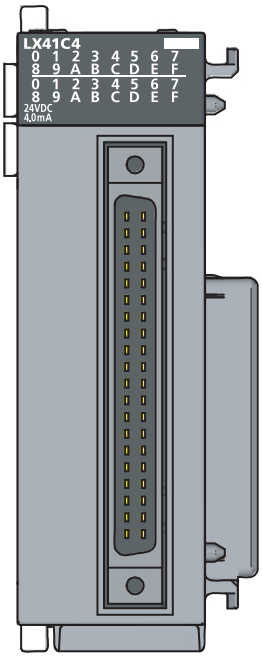
Derating chart



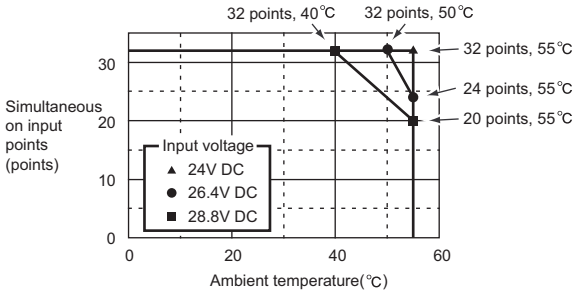
External connections	Terminal connections
	

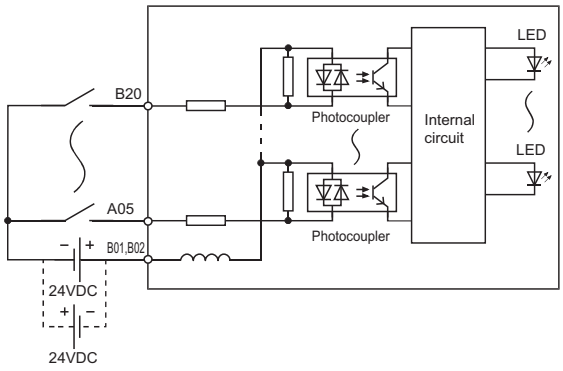
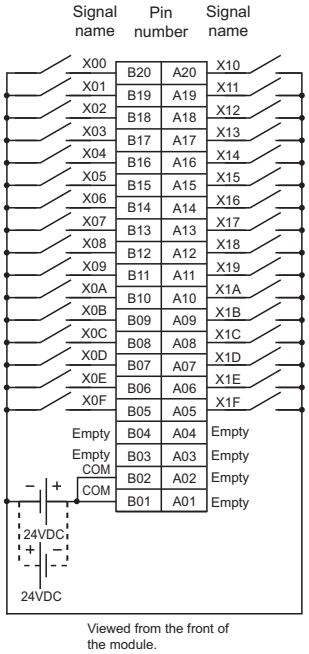
Viewed from the front of the module.

4.2.4 LX41C4 DC input module

Item		Specifications	Appearance
Number of input points		32 points	
Rated input voltage		24VDC (ripple rate: 5% or less) (Allowable voltage range: 20.4 to 28.8VDC)	
Rated input current		4.0mA TYP. (at 24VDC)	
ON voltage/ON current		19V or higher/3mA or higher	
OFF voltage/OFF current		9V or lower/1.7mA or lower	
Input resistance		5.7kΩ	
Response time	OFF to ON	1ms, 5ms, 10ms, 20ms, 70ms or less (PLC parameter setting of CPU module) Initial setting is 10ms.	
	ON to OFF	1ms, 5ms, 10ms, 20ms, 70ms or less (PLC parameter setting of CPU module) Initial setting is 10ms.	
Dielectric withstand voltage		510VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP2X	
Common terminal arrangement		32 points/common (common terminal: B01, B02)	
Number of occupied I/O points		32 points (I/O assignment: input 32 points)	
External interface		40-pin connector (☞ Page 64, Section 6.2.2)	
5VDC internal current consumption		100mA (TYP. all points ON)	
Weight		0.11kg	

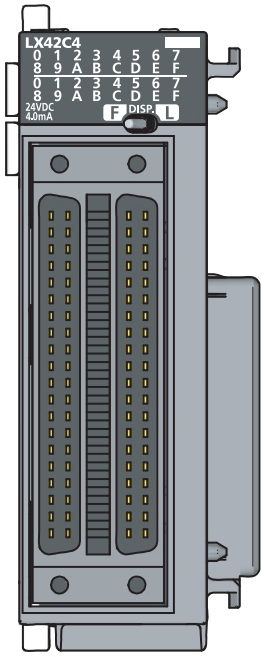
Derating chart



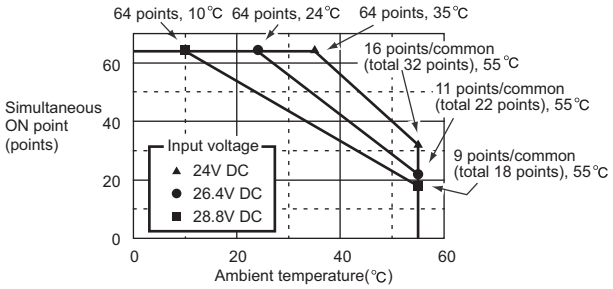
External connections	Terminal connections
	

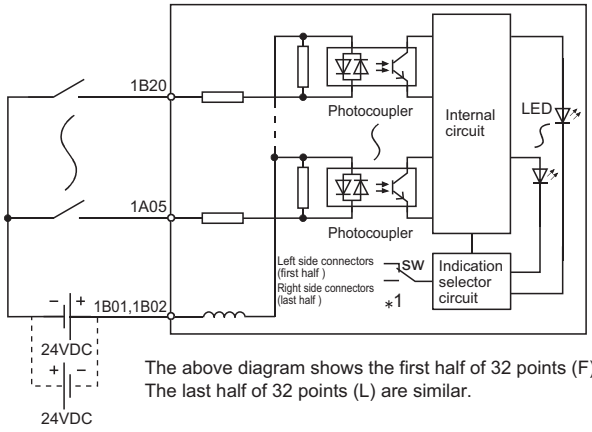
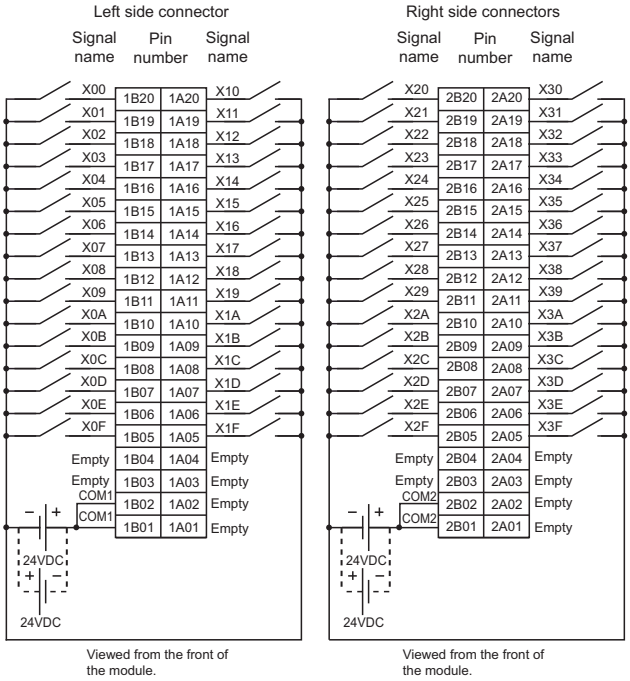
Viewed from the front of the module.

4.2.5 LX42C4 DC input module

Item		Specifications	Appearance
Number of input points		64 points	
Rated input voltage		24VDC (ripple rate: 5% or less) (Allowable voltage range: 20.4 to 28.8VDC)	
Rated input current		4.0mA TYP. (at 24VDC)	
ON voltage/ON current		19V or higher/3mA or higher	
OFF voltage/OFF current		9V or lower/1.7mA or lower	
Input resistance		5.7kΩ	
Response time	OFF to ON	1ms, 5ms, 10ms, 20ms, 70ms or less (PLC parameter setting of CPU module) Initial setting is 10ms.	
	ON to OFF	1ms, 5ms, 10ms, 20ms, 70ms or less (PLC parameter setting of CPU module) Initial setting is 10ms.	
Dielectric withstand voltage		510VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP2X	
Common terminal arrangement		32 points/common (common terminal: 1B01, 1B02, 2B01, 2B02)	
Number of occupied I/O points		64 points (I/O assignment: input 64 points)	
External interface		40-pin connector (☞ Page 64, Section 6.2.2)	
5VDC internal current consumption		120mA (TYP. all points ON)	
Weight		0.12kg	

Derating chart



External connections	Terminal connections
 The above diagram shows the first half of 32 points (F). The last half of 32 points (L) are similar.	

*1 Switching left side (F) provides the first half (X00 to X1F) LED indications, and switching right side (L) provides the latter half (Y20 to Y3F) LED indications.

4.3 Output Module Specifications

The following output module equips the overload protection function and the overheat protection function.

Applicable model ····· LY40NT5P, LY41NT1P, LY42NT1P, LY40PT5P, LY41PT1P, LY42PT1P

Function	Description
Overload protection function*1	• If the output module detects overcurrent, it limits output current by the current limiter operation*2 • For the overcurrent detection value and the limited current, refer to "Overload protection function" on the module specifications. • When the load current becomes lower than the overcurrent detection value, the module returns to normal operation.
Overheat protection function*1	• If overcurrent keeps flowing due to overload, heat is generated inside the module. When high heat is detected inside the module, the output is turned off. • The number of output points that the overheat protection function simultaneously operates differs depending on the module. For the number, refer to "Overheat protection function" on the module specifications. • After heat goes down, the module returns to normal operation.

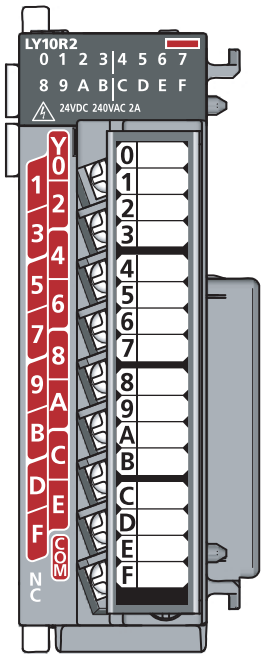
*1 This function is for protecting the internal circuit of the module, not for protecting external devices.
Also, leaving the failure too long may rise the internal temperature of the module, resulting in deterioration of output elements and/or discoloration of a case and printed circuit board. When the failure occurs, turn off the corresponding outputs immediately to remove the causes.

*2 This operation limits overcurrent to a constant value and keeps outputting it.

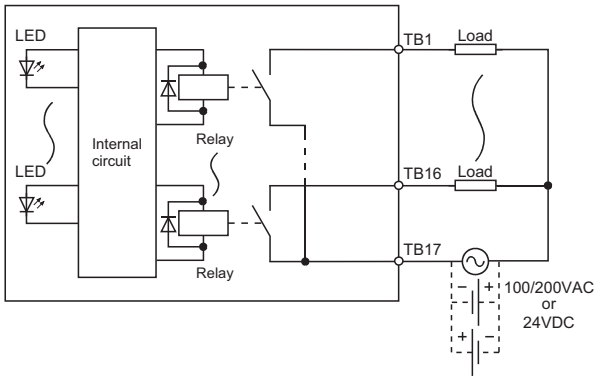
4.3.1 LY10R2 contact output module

Item		Specifications
Number of output points		16 points
Rated switching voltage, current		24VDC 2A (resistance load)/point, 8A/common 240VAC 2A (COSϕ = 1)/point, 8A/common
Minimum switching load		5VDC 1mA
Maximum switching load		264VAC 125VDC
Response time	OFF to ON	10ms or less
	ON to OFF	12ms or less
Life	Mechanical	20 million times or more
	Electrical	Page 23, Section 3.2 (3) (a)
Maximum switching frequency		3600 times/hour
Surge suppressor		None
Fuse		None
Dielectric withstand voltage		2300VAC, 1 minute (altitude 2000m)
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
Protection degree		IP1X
Common terminal arrangement		16 points/common (common terminal: TB17)
Number of occupied I/O points		16 points (I/O assignment: output 16 points)
External interface		18-point screw terminal block (M3 × 6 screws) (Page 62, Section 6.2.1)
5VDC internal current consumption		460mA (TYP. all points ON)
Weight		0.21kg

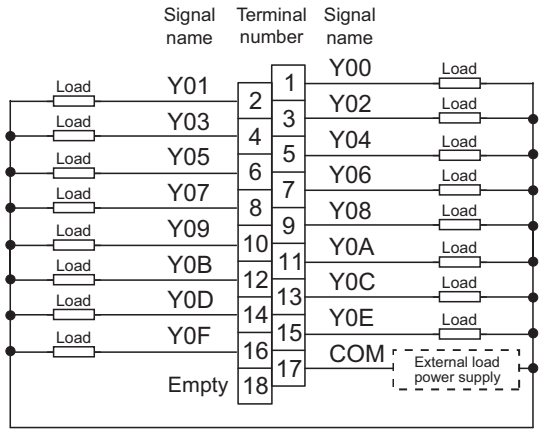
Appearance



External connections

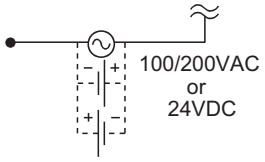


Terminal connections

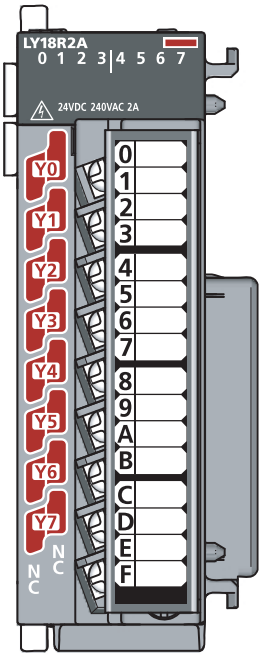


Viewed from the front of the module.

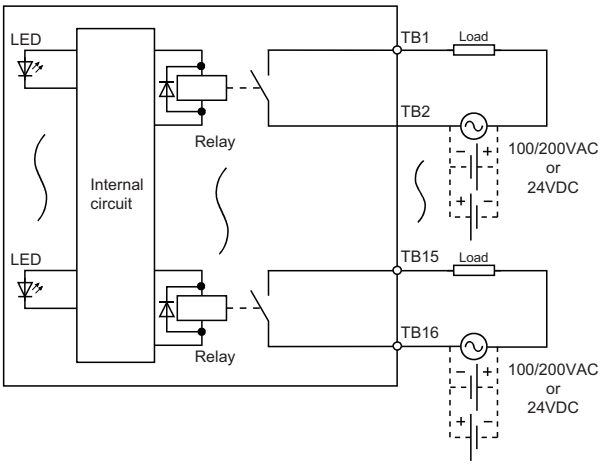
The following diagram shows the external load power supply.



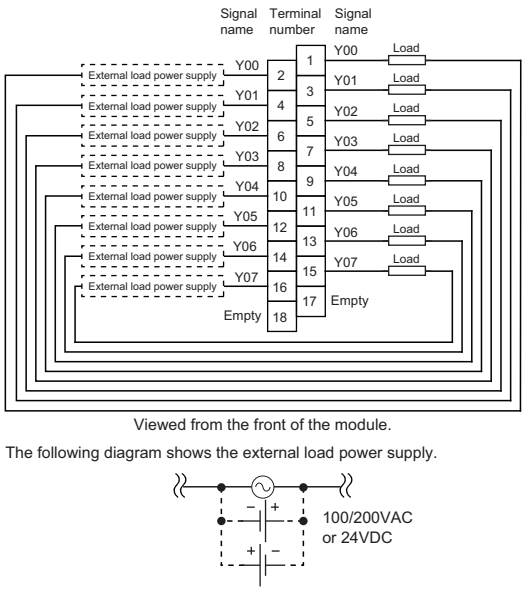
4.3.2 LY18R2A contact output module (All points independent)

Item		Specifications	Appearance
Number of output points		8 points	
Insulation method		Relay	
Rated switching voltage, current		24VDC 2A (resistance load)/point, 8A/module 240VAC 2A (COSϕ = 1)/point, 8A/module	
Minimum switching load		5VDC 1mA	
Maximum switching load		264VAC 125VDC	
Response time	OFF to ON	10ms or less	
	ON to OFF	12ms or less	
Life	Mechanical	20 million times or more	
	Electrical	Page 23, Section 3.2 (3) (a)	
Maximum switching frequency		3600 times/hour	
Surge suppressor		None	
Fuse		None (Attaching a fuse to each external wiring is recommended.)	
Dielectric withstand voltage		2300VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP1X	
Common terminal arrangement		No common (all-point independent contact)	
Number of occupied I/O points		16 points (I/O assignment: output 16 points)	
External interface		18-point screw terminal block (M3 × 6 screws) (Page 62, Section 6.2.1)	
5VDC internal current consumption		260mA (TYP. all points ON)	
Weight		0.18kg	

External connections



Terminal connections



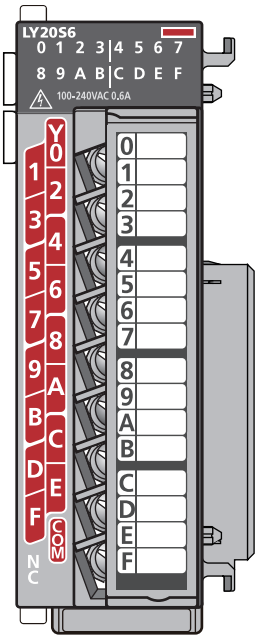
Viewed from the front of the module.

The following diagram shows the external load power supply.

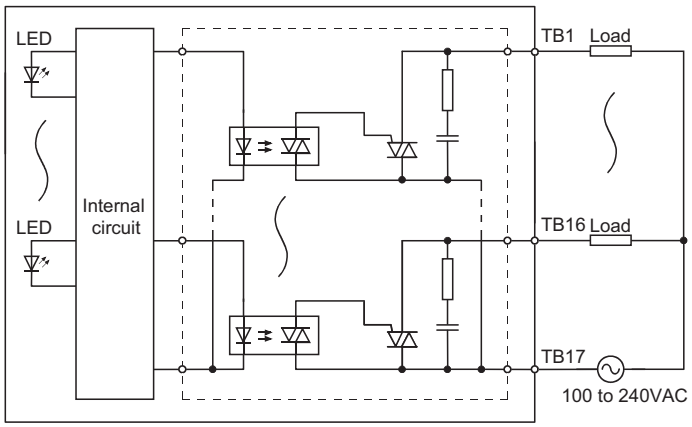
4.3.3 LY20S6 triac output module

Item		Specifications
Number of output points		16 points
Rated load voltage, frequency		100 to 240VAC (+10%/-15%), 50/60Hz(±3Hz)
Maximum load current		0.6A/point, 4.8A/common
Load voltage distortion ratio		Within 5%
Maximum load voltage		264VAC
Minimum load voltage/current		24VAC/100mA, 100VAC/25mA, 240VAC/25mA
Maximum inrush current		20A/cycle or less
Leakage current at OFF		3mA or lower (at 240V, 60Hz), 1.5mA or lower (at 120V, 60Hz)
Maximum voltage drop at ON		1.5V or lower (at load current of 0.6A)
Response time	OFF to ON	Total of 1ms and 0.5 cycles or less
	ON to OFF	Total of 1ms and 0.5 cycles or less (rated load, resistive load)
Surge suppressor		CR absorber
Fuse		None (Attaching a fuse to each external wiring is recommended.)
Dielectric withstand voltage		2300VAC, 1 minute (altitude 2000m)
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
Protection degree		IP1X
Common terminal arrangement		16 points/common (common terminal: TB17)
Number of occupied I/O points		16 points (I/O assignment: output 16 points)
External interface		18-point screw terminal block (M3 × 6 screws)(Page 62, Section 6.2.1)
5VDC internal current consumption		300mA (TYP. all points ON)
Weight		0.22kg

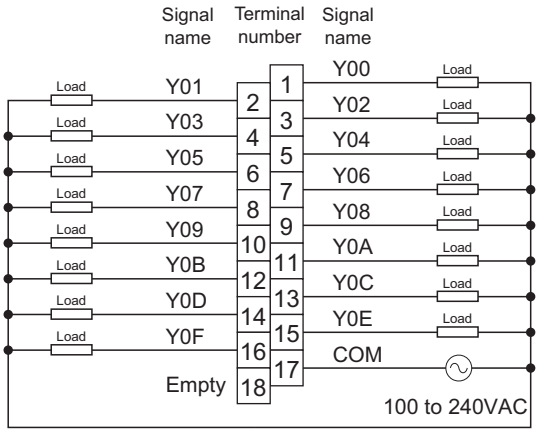
Appearance



External connections

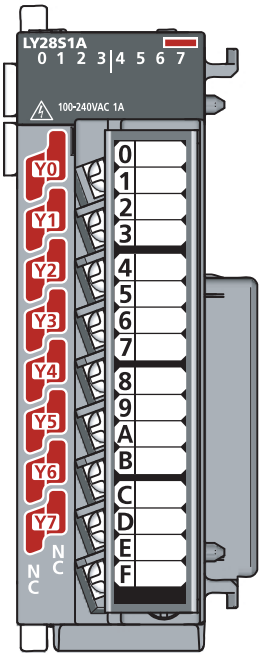


Terminal connections

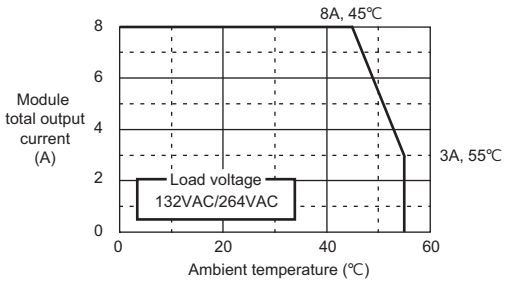


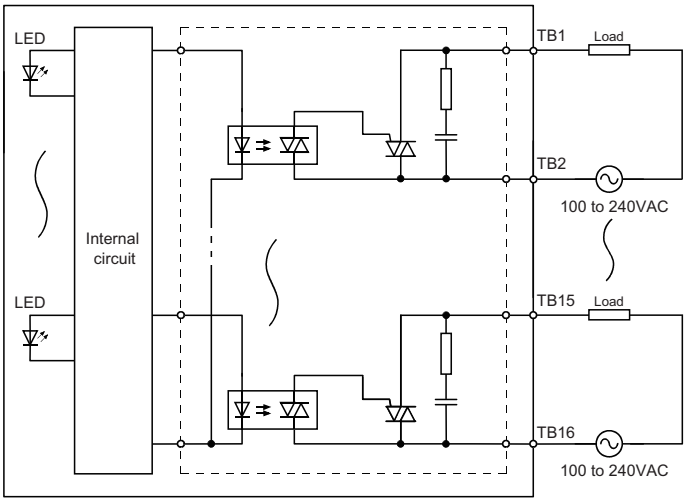
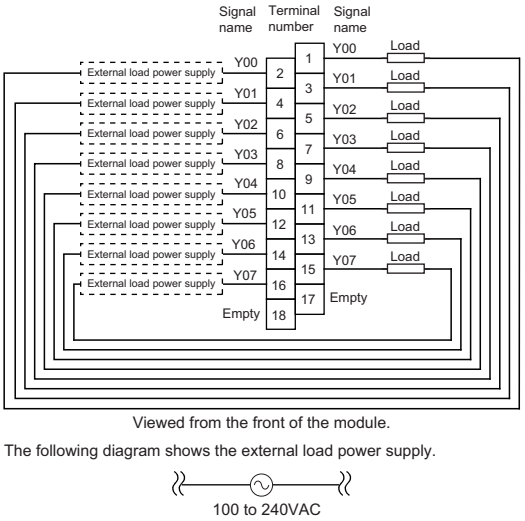
Viewed from the front of the module.

4.3.4 LY28S1A triac output module (All points independent)

Item		Specifications	Appearance
Number of output points		8 points	
Insulation method		Photocoupler isolation	
Rated load voltage, frequency		100 to 240VAC (+10%/-15%), 50/60Hz(±3Hz)	
Maximum load current		1A/point, 8A/module	
Load voltage distortion ratio		Within 5%	
Maximum load voltage		264VAC	
Minimum load voltage/current		24VAC/100mA, 100VAC/25mA, 240VAC/25mA	
Maximum inrush current		20A/cycle or less	
Leakage current at OFF		3mA or lower (at 240V, 60Hz), 1.5mA or lower (at 120V, 60Hz)	
Maximum voltage drop at ON		1.5V or lower (at load current of 0.6A)	
Response time	OFF to ON	Total of 1ms and 0.5 cycles or less	
	ON to OFF	Total of 1ms and 0.5 cycles or less (rated load, resistive load)	
Surge suppressor		CR absorber	
Fuse		None (Attaching a fuse to each external wiring is recommended.)	
Dielectric withstand voltage		2300VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP1X	
Common terminal arrangement		No common (all points independent)	
Number of occupied I/O points		16 points (I/O assignment: output 16 points)	
External interface		18-point screw terminal block (M3 × 6 screws) (☞ Page 62, Section 6.2.1)	
5VDC internal current consumption		200mA (TYP. all points ON)	
Weight		0.19kg	

Derating chart

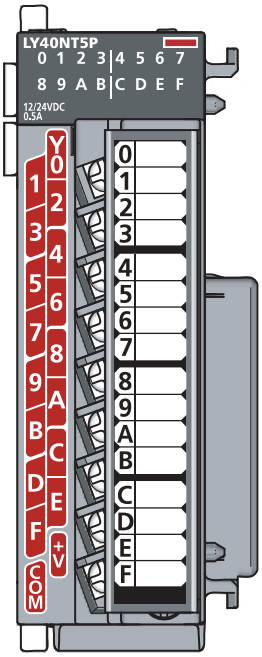


External connections	Terminal connections
	

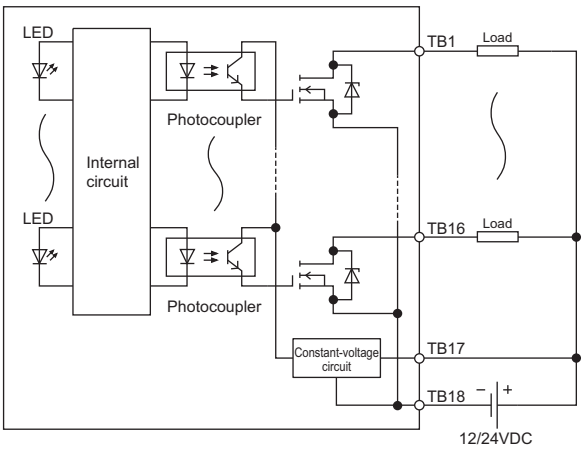
Viewed from the front of the module.

The following diagram shows the external load power supply.

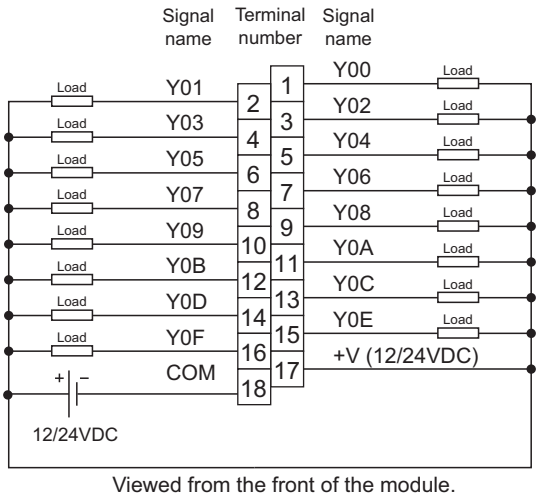
4.3.5 LY40NT5P transistor output module (Sink type)

Item		Specifications	Appearance
Number of output points		16 points	
Rated load voltage		10.2 to 28.8VDC	
Maximum load current		0.5A/point, 5A/common	
Maximum inrush current		Current is limited by the overload protection function.	
Leakage current at OFF		0.1mA or less	
Maximum voltage drop at ON		0.2VDC (TYP.) 0.5A, 0.3VDC (MAX.) 0.5A	
Response time	OFF to ON	0.5ms or less	
	ON to OFF	1ms or less (rated load, resistance load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple rate: 5% or less) (Allowable voltage range: 10.2 to 28.8VDC)	
	Current	9mA (at 24VDC)/common	
Dielectric withstand voltage		510VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP2X	
Common terminal arrangement		16 points/common (common terminal: TB18)	
Number of occupied I/O points		16 points (I/O assignment: output 16 points)	
Protection function	Overload protection function	Limited current when detecting overcurrent (overload protection): 1.5 to 3.5A/point Activated in increments of 1 point. (Page 38, Section 4.3)	
	Overheat protection function	Activated in increments of 1 point. (Page 38, Section 4.3)	
External interface		18-point screw terminal block (M3 × 6 screws)(Page 62, Section 6.2.1)	
5VDC internal current consumption		100mA (TYP. all points ON)	
Weight		0.15kg	

External connections

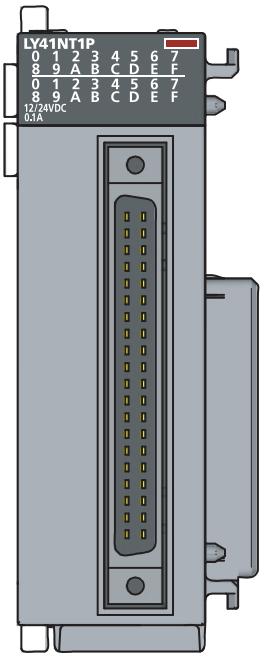


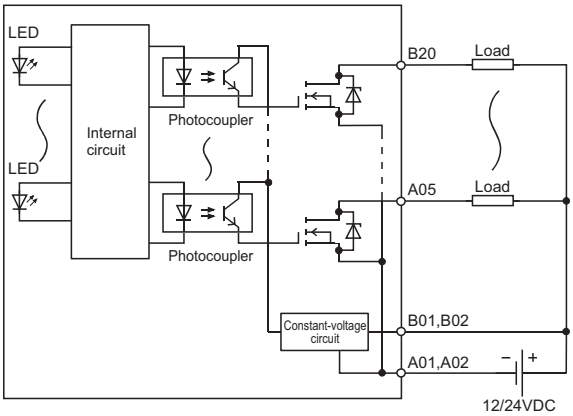
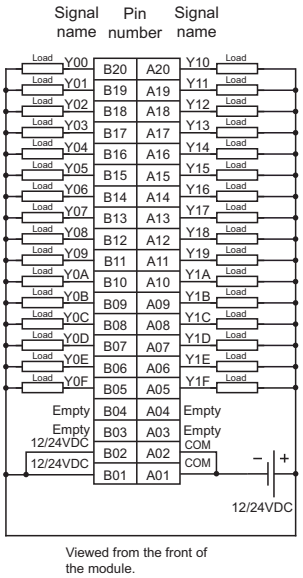
Terminal connections



Viewed from the front of the module.

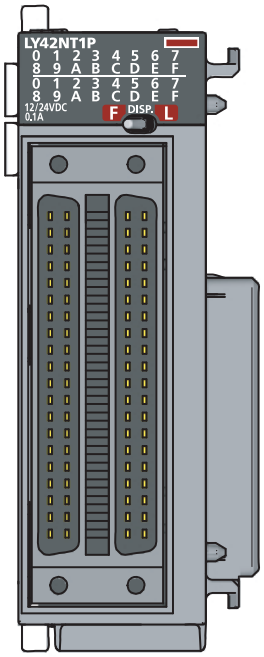
4.3.6 LY41NT1P transistor output module (Sink type)

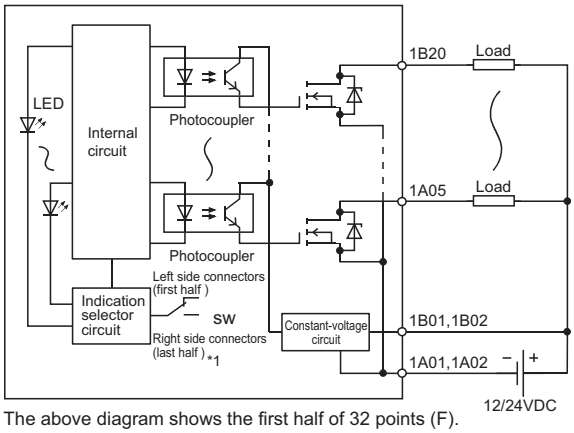
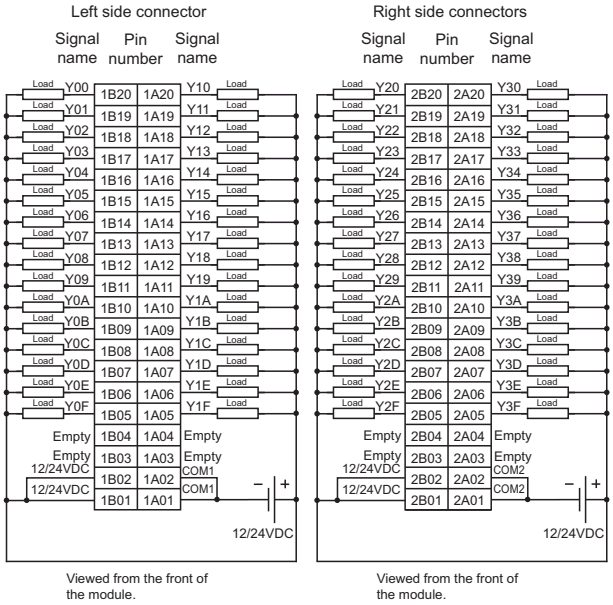
Item		Specifications	Appearance
Number of output points		32 points	
Rated load voltage		10.2 to 28.8VDC	
Maximum load current		0.1A/point, 2A/common	
Maximum inrush current		Current is limited by the overload protection function.	
Leakage current at OFF		0.1mA or less	
Maximum voltage drop at ON		0.1VDC (TYP.) 0.1A, 0.2VDC (MAX.) 0.1A	
Response time	OFF to ON	0.5ms or less	
	ON to OFF	1ms or less (rated load, resistance load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple rate: 5% or less) (Allowable voltage range: 10.2 to 28.8VDC)	
	Current	13mA (at 24VDC)	
Dielectric withstand voltage		510VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP2X	
Common terminal arrangement		32 points/common (common terminal: A01, A02)	
Number of occupied I/O points		32 points (I/O assignment: output 32 points)	
Protection functions	Overload protection function	Limited current when detecting overcurrent (overload protection): 1 to 3A/point Activated in increments of 1 point. (☞ Page 38, Section 4.3)	
	Overheat protection function	Activated in increments of 1 point. (☞ Page 38, Section 4.3)	
External interface		40-pin connector (☞ Page 64, Section 6.2.2)	
5VDC internal current consumption		140mA (TYP. all points ON)	
Weight		0.11kg	

External connections	Terminal connections
	

Viewed from the front of the module.

4.3.7 LY42NT1P transistor output module (Sink type)

Item		Specifications	Appearance
Number of output points		64 points	
Rated load voltage		10.2 to 28.8VDC	
Maximum load current		0.1A/point, 2A/common	
Maximum inrush current		Current is limited by the overload protection function.	
Leakage current at OFF		0.1mA or less	
Maximum voltage drop at ON		0.1VDC (TYP.) 0.1A, 0.2VDC (MAX.) 0.1A	
Response time	OFF to ON	0.5ms or less	
	ON to OFF	1ms or less (rated load, resistance load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple rate: 5% or less) (Allowable voltage range: 10.2 to 28.8VDC)	
	Current	9mA (at 24VDC)/common	
Dielectric withstand voltage		510VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP2X	
Common terminal arrangement		32 points/common (common terminal: 1A01, 1A02, 2A01, 2A02)	
Number of occupied I/O points		64 points (I/O assignment: output 64 points)	
Protection function	Overload protection function	Limited current when detecting overcurrent (overload protection): 1 to 3A/point Activated in increments of 1 point. (☞ Page 38, Section 4.3)	
	Overheat protection function	Activated in increments of 1 points. (☞ Page 38, Section 4.3)	
External interface		40-pin connector (☞ Page 64, Section 6.2.2)	
5VDC internal current consumption		190mA (TYP. all points ON)	
Weight		0.12kg	

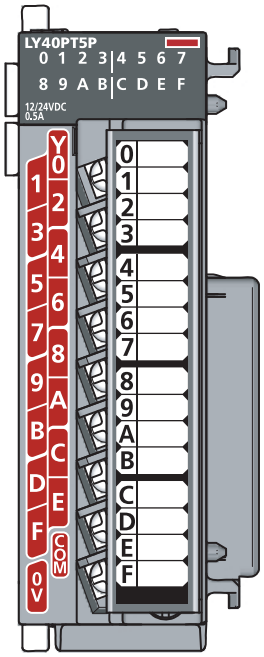
External connections	Terminal connections
 The above diagram shows the first half of 32 points (F). The last half of 32 points (L) are similar.	

*1 Switching left side (F) provides the first half (Y00 to Y1F) LED indications, and switching right side (L) provides the latter half (Y20 to Y3F) LED indications.

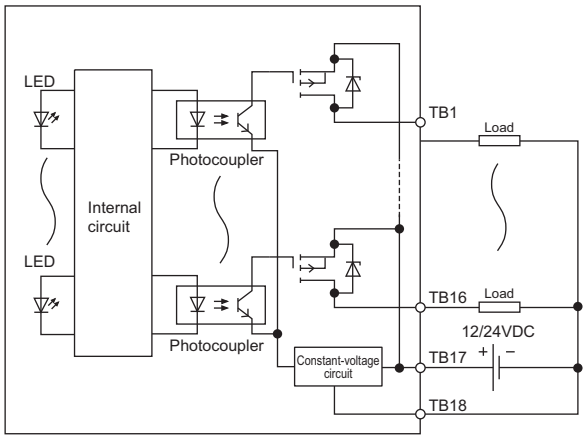
4.3.8 LY40PT5P transistor output module (Source type)

Item		Specifications
Number of output points		16 points
Rated load voltage		10.2 to 28.8VDC
Maximum load current		0.5A/point, 5A/common
Maximum inrush current		Current is limited by the overload protection function.
Leakage current at OFF		0.1mA or less
Maximum voltage drop at ON		0.2VDC (TYP.) 0.5A, 0.3VDC (MAX.) 0.5A
Response time	OFF to ON	0.5ms or less
	ON to OFF	1ms or less (rated load, resistance load)
Surge suppressor		Zener diode
Fuse		None
External power supply	Voltage	12/24VDC (ripple rate: 5% or less) (Allowable voltage range: 10.2 to 28.8VDC)
	Current	17mA (at 24VDC)
Dielectric withstand voltage		510VAC, 1 minute (altitude 2000m)
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
Protection degree		IP2X
Common terminal arrangement		16 points/common (common terminal: TB17)
Number of occupied I/O points		16 points (I/O assignment: output 16 points)
Protection function	Overload protection function	Overcurrent detection: 1.5A or more/point Activated in increments of 1 point. (Page 38, Section 4.3)
	Overheat protection function	Activated in increments of 1 point. (Page 38, Section 4.3)
External interface		18-point screw terminal block (M3 × 6 screws)(Page 62, Section 6.2.1)
5VDC internal current consumption		100mA (TYP. all points ON)
Weight		0.15kg

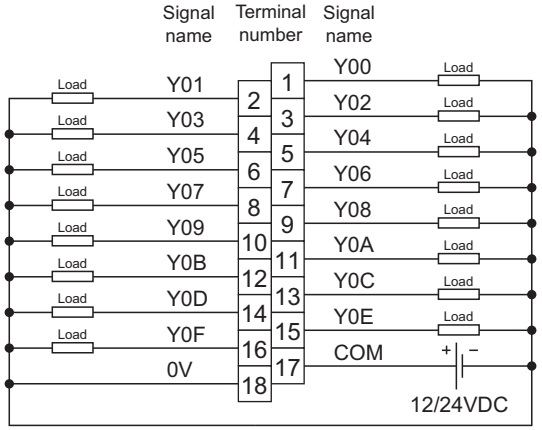
Appearance



External connections

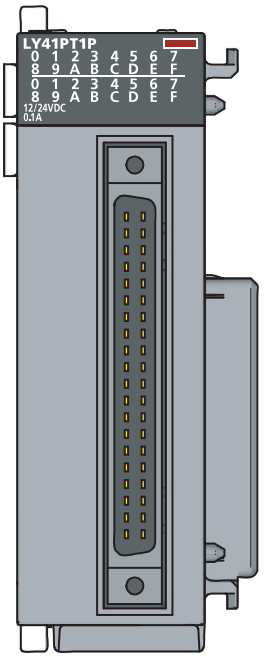


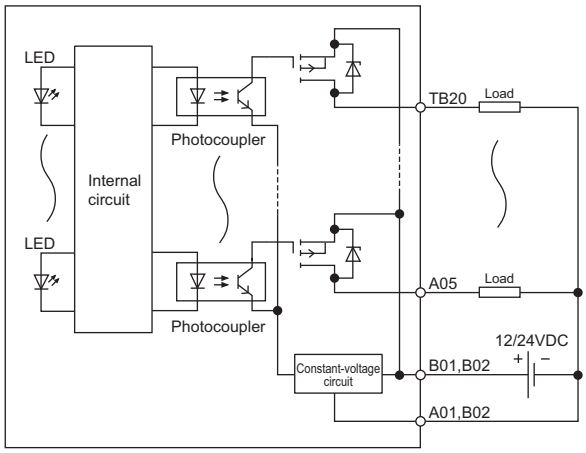
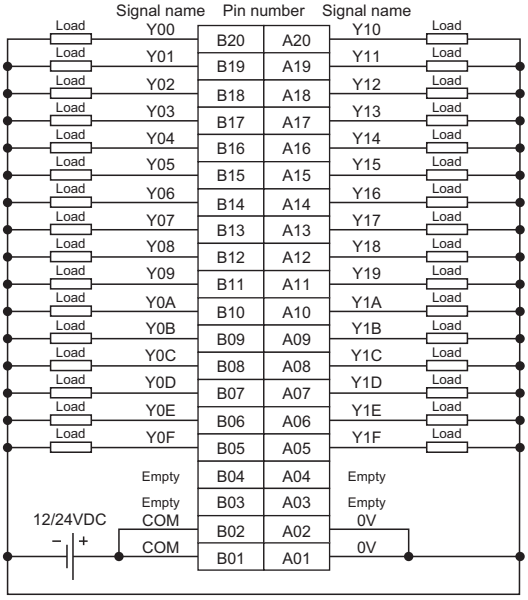
Terminal connections



Viewed from the front of the module.

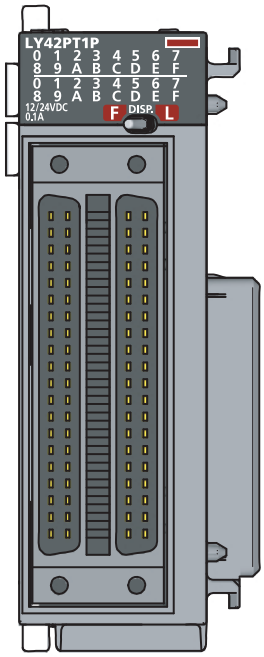
4.3.9 LY41PT1P transistor output module (Source type)

Item		Specifications	Appearance
Number of output points		32 points	
Rated load voltage		10.2 to 28.8VDC	
Max. load current		0.1A/point, 2A/common	
Max. inrush current		Current is limited by the overload protection function.	
Leakage current at OFF		0.1mA or less	
Maximum voltage drop at ON		0.1VDC (TYP.) 0.1A, 0.2VDC (MAX.) 0.1A	
Response time	OFF to ON	0.5ms or less	
	ON to OFF	1ms or less (rated load, resistance load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple rate: 5% or less) (Allowable voltage range: 10.2 to 28.8VDC)	
	Current	20mA (at 24VDC)	
Dielectric withstand voltage		510VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP2X	
Common terminal arrangement		32 points/common (common terminal: B01, B02)	
Number of occupied I/O points		32 points (I/O assignment: output 32 points)	
Protection function	Overload protection function	Limited current when detecting overcurrent (overload protection): 1 to 3A/point Activated in increments of 1 point. (☞ Page 38, Section 4.3)	
	Overheat protection function	Activated in increments of 2 points. (☞ Page 38, Section 4.3)	
External interface		40-pin connector (☞ Page 64, Section 6.2.2)	
5VDC internal current consumption		140mA (TYP. all points ON)	
Weight		0.11kg	

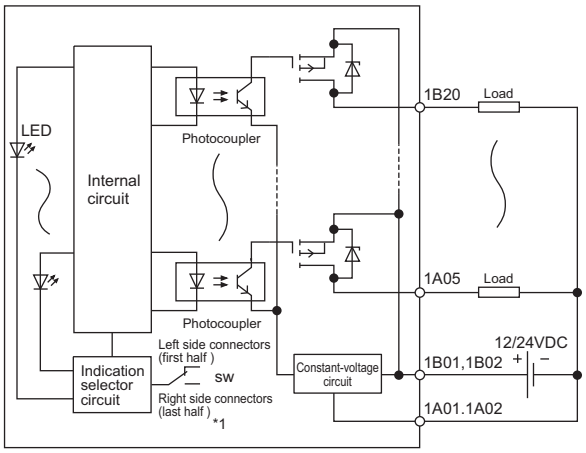
External connections	Terminal connections
	

Viewed from the front of the module.

4.3.10 LY42PT1P transistor output module (Source type)

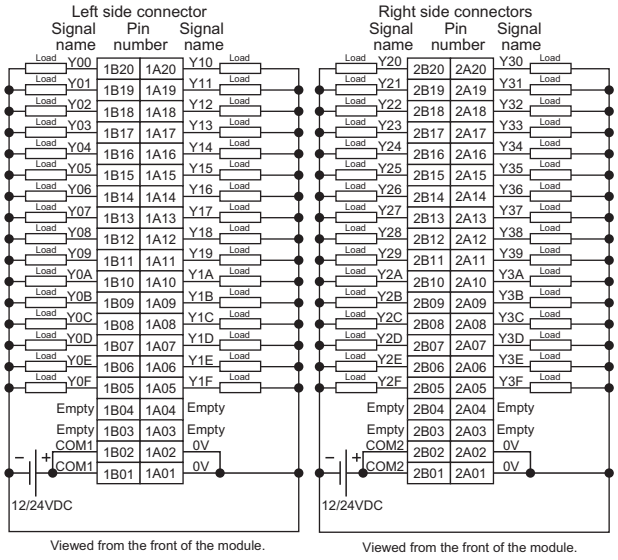
Item		Specifications	Appearance
Number of output points		64 points	
Rated load voltage		10.2 to 28.8VDC	
Max. load current		0.1A/point, 2A/common	
Max. inrush current		Current is limited by the overload protection function.	
Leakage current at OFF		0.1mA or less	
Maximum voltage drop at ON		0.1VDC (TYP.) 0.1A, 0.2VDC (MAX.) 0.1A	
Response time	OFF to ON	0.5ms or less	
	ON to OFF	1ms or less (rated load, resistance load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple rate: 5% or less) (Allowable voltage range: 10.2 to 28.8VDC)	
	Current	20mA (at 24VDC)/common	
Dielectric withstand voltage		510VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP2X	
Common terminal arrangement		32 points/common (common terminal: 1B01, 1B02, 2B01, 2B02)	
Number of occupied I/O points		64 points (I/O assignment: output 64 points)	
Protection function	Overload protection function	Limited current when detecting overcurrent (overload protection): 1 to 3A/point Activated in increments of 1 point. (☞ Page 38, Section 4.3)	
	Overheat protection function	Activated in increments of 2 point. (☞ Page 38, Section 4.3)	
External interface		40-pin connector (☞ Page 64, Section 6.2.2)	
5VDC internal current consumption		190mA (TYP. all points ON)	
Weight		0.12kg	

External connections



The above diagram shows the first half of 32 points (F).
The last half of 32 points (L) are similar.

Terminal connections



*1 Switching left side (F) provides the first half (Y00 to Y1F) LED indications, and switching right side (L) provides the latter half (Y20 to Y3F) LED indications.

4.4 I/O Combined Module Specifications

The I/O combined module equips the overload protection function and the overheat protection function.

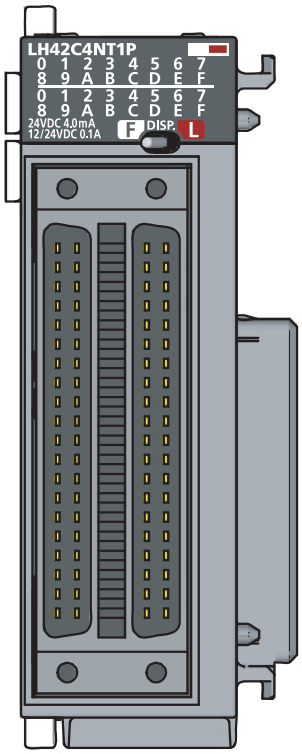
Function	Description
Overload protection function*1	• If the output side detects overcurrent, it limits output current by the current limiter operation*2 • For the overcurrent detection value and the limited current, refer to "Overload protection function" on the module specifications. • When the load current becomes lower than the overcurrent detection value, the module returns to normal operation.
Overheat protection function*1	• If overcurrent keeps flowing due to overload on the output side, heat is generated inside the module. When high heat is detected inside the module, the output is turned off. • The number of output points that the overheat protection function simultaneously operates differs depending on the module. For the number, refer to "Overheat protection function" on the module specifications. • After heat goes down, the module returns to normal operation.

*1 This function is for protecting the internal circuit of the module, not for protecting external devices.
Also, leaving the failure too long may rise the internal temperature of the module, resulting in deterioration of output elements and/or discoloration of a case and printed circuit board. When the failure occurs, turn off the corresponding outputs immediately to remove the causes.

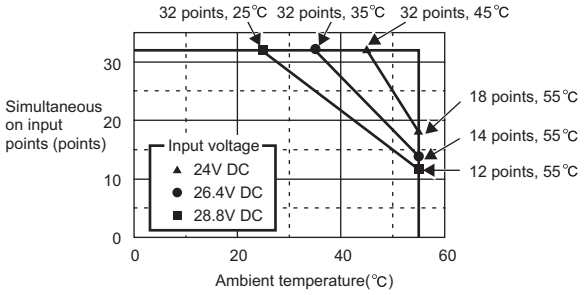
*2 This operation limits overcurrent to a constant value and keeps outputting it.

4.4.1 LH42C4NT1P DC input/transistor output combined module (Sink type)

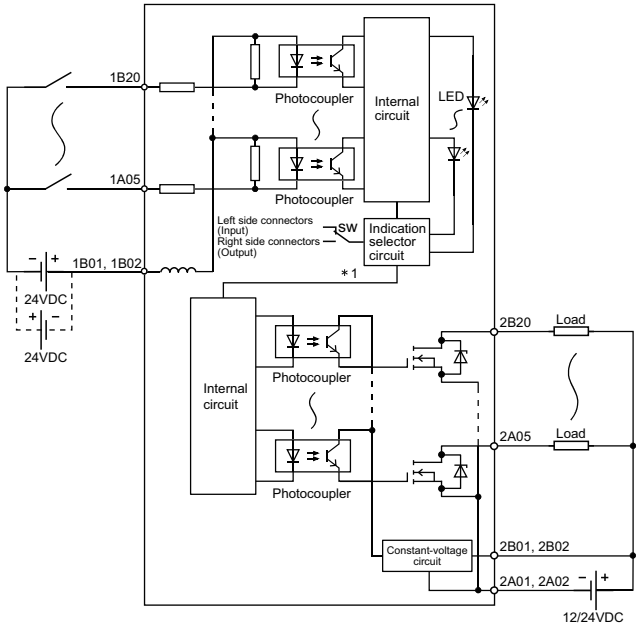
Item		Specifications	Appearance
■ Input specifications			
Number of input points		32 points	
Rated input voltage		24VDC (ripple rate: 5% or less) (Allowable voltage range: 20.4 to 28.8VDC)	
Rated input current		4.0mA TYP. (at 24VDC)	
Input ON voltage/ON current		19VDC or higher/3mA or higher	
Input OFF voltage/OFF current		9VDC or lower/1.7mA or lower	
Input resistance		5.7kΩ	
Input response time	OFF to ON	1ms, 5ms, 10ms, 20ms, 70ms or less (PLC parameter setting of CPU module) Initial setting is 10ms.	
	ON to OFF	1ms, 5ms, 10ms, 20ms, 70ms or less (PLC parameter setting of CPU module) Initial setting is 10ms.	
Input common terminal arrangement		32 points/common (common terminal: 1B01, 1B02)	
■ Output specifications			
Number of output points		32 points	
Rated load voltage		10.2 to 28.8VDC	
Maximum load current		0.1A/point, 2A/common	
Maximum inrush current		Current is limited by the overload protection function.	
Leakage current at OFF		0.1mA or less	
Maximum voltage drop at ON		0.1VDC (TYP.) 0.1A, 0.2VDC (MAX.) 0.1A	
Output response time	OFF to ON	0.5ms or less	
	ON to OFF	1ms or less (rated load, resistance load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple rate: 5% or less) (Allowable voltage range: 10.2 to 28.8VDC)	
	Current	9mA (at 24VDC)/common	
Output common terminal arrangement		32 points/common (common terminal: 2A01, 2A02)	
Protection function	Overload protection function	Limited current when detecting overcurrent (overload protection): 1 to 3A/point Activated in increments of 1 point. (☞ Page 53, Section 4.4)	
	Overheat protection function	Activated in increments of 1 point. (☞ Page 53, Section 4.4)	
■ Common specifications			
Dielectric withstand voltage		510VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP2X	
Number of occupied I/O points		32 points (I/O assignment: input/output 32 points)	
External interface		40-pin connector (☞ Page 64, Section 6.2.2)	
5VDC internal current consumption		160mA (TYP. all points ON)	
Weight		0.12kg	



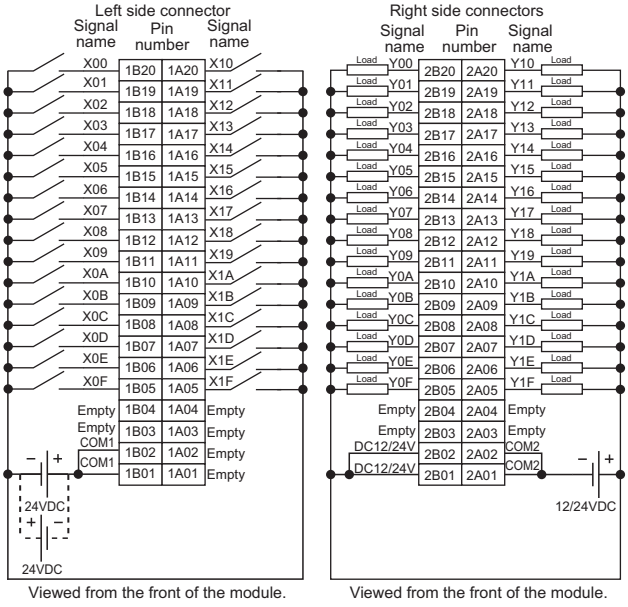
Derating chart



External connections



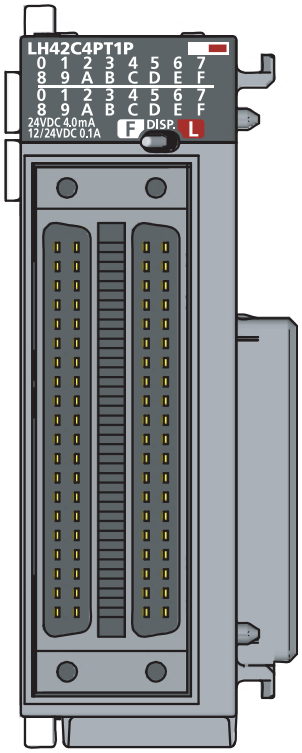
Terminal connections



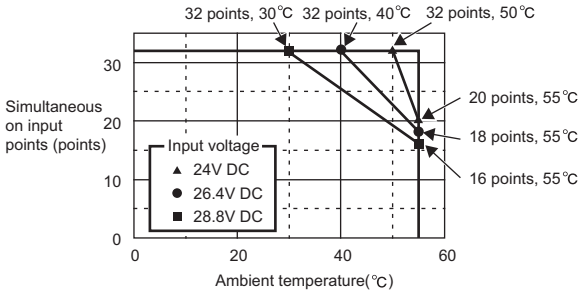
*1 Switching left side (F) provides the input (X00 to X1F) LED indications, and switching right side (L) provides the output (Y00 to Y1F) LED indications.

4.4.2 LH42C4PT1P DC input/transistor output combined module (Source type)

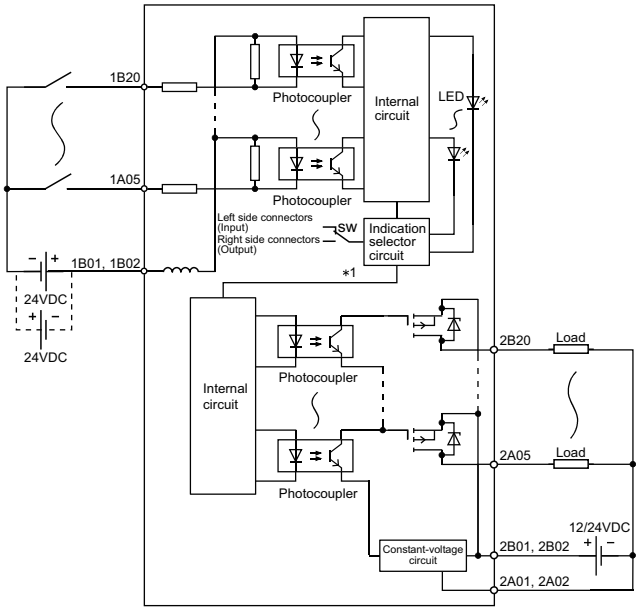
Item		Specifications	Appearance
■ Input specifications			
Number of input points		32 points	
Rated input voltage		24VDC (ripple rate: 5% or less) (Allowable voltage range: 20.4 to 28.8VDC)	
Rated input current		4.0mA TYP. (at 24VDC)	
Input ON voltage/ON current		19VDC or higher/3mA or higher	
Input OFF voltage/OFF current		9VDC or lower/1.7mA or lower	
Input resistance		5.7kΩ	
Input response time	OFF to ON	1ms, 5ms, 10ms, 20ms, 70ms or less (PLC parameter setting of CPU module) Initial setting is 10ms.	
	ON to OFF	1ms, 5ms, 10ms, 20ms, 70ms or less (PLC parameter setting of CPU module) Initial setting is 10ms.	
Input common terminal arrangement		32 points/common (common terminal: 1B01, 1B02)	
■ Output specifications			
Number of output points		32 points	
Rated load voltage		10.2 to 28.8VDC	
Maximum load current		0.1A/point, 2A/common	
Maximum inrush current		Current is limited by the overload protection function.	
Leakage current at OFF		0.1mA or less	
Maximum voltage drop at ON		0.1VDC (TYP.) 0.1A, 0.2VDC (MAX.) 0.1A	
Output response time	OFF to ON	0.5ms or less	
	ON to OFF	1ms or less (rated load, resistance load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple rate: 5% or less) (Allowable voltage range: 10.2 to 28.8VDC)	
	Current	20mA (at 24VDC)/common	
Output common terminal arrangement		32 points/common (common terminal: 2B01, 2B02)	
Protection function	Overload protection function	Limited current when detecting overcurrent (overload protection): 1 to 3A/point Activated in increments of 1 point. (☞ Page 53, Section 4.4)	
	Overheat protection function	Activated in increments of 2 points. (☞ Page 53, Section 4.4)	
■ Common specifications			
Dielectric withstand voltage		510VAC, 1 minute (altitude 2000m)	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
Protection degree		IP2X	
Number of occupied I/O points		32 points (I/O assignment: input/output 32 points)	
External interface		40-pin connector (☞ Page 64, Section 6.2.2)	
5VDC internal current consumption		150mA (TYP. all points ON)	
Weight		0.12kg	



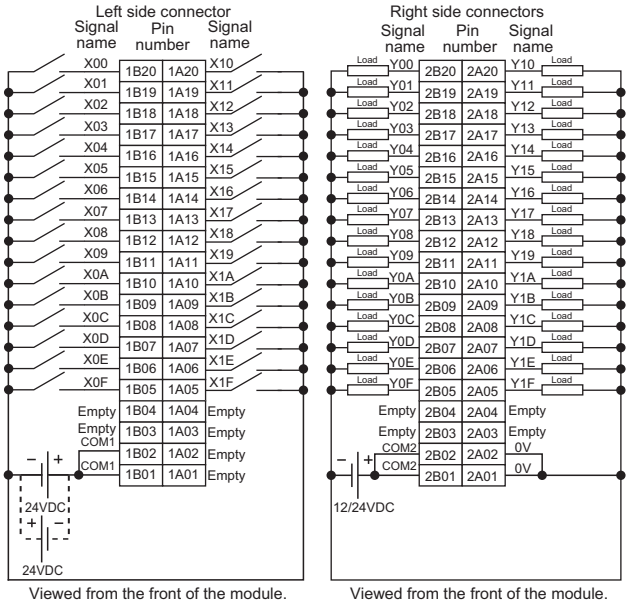
Derating chart



External connections



Terminal connections



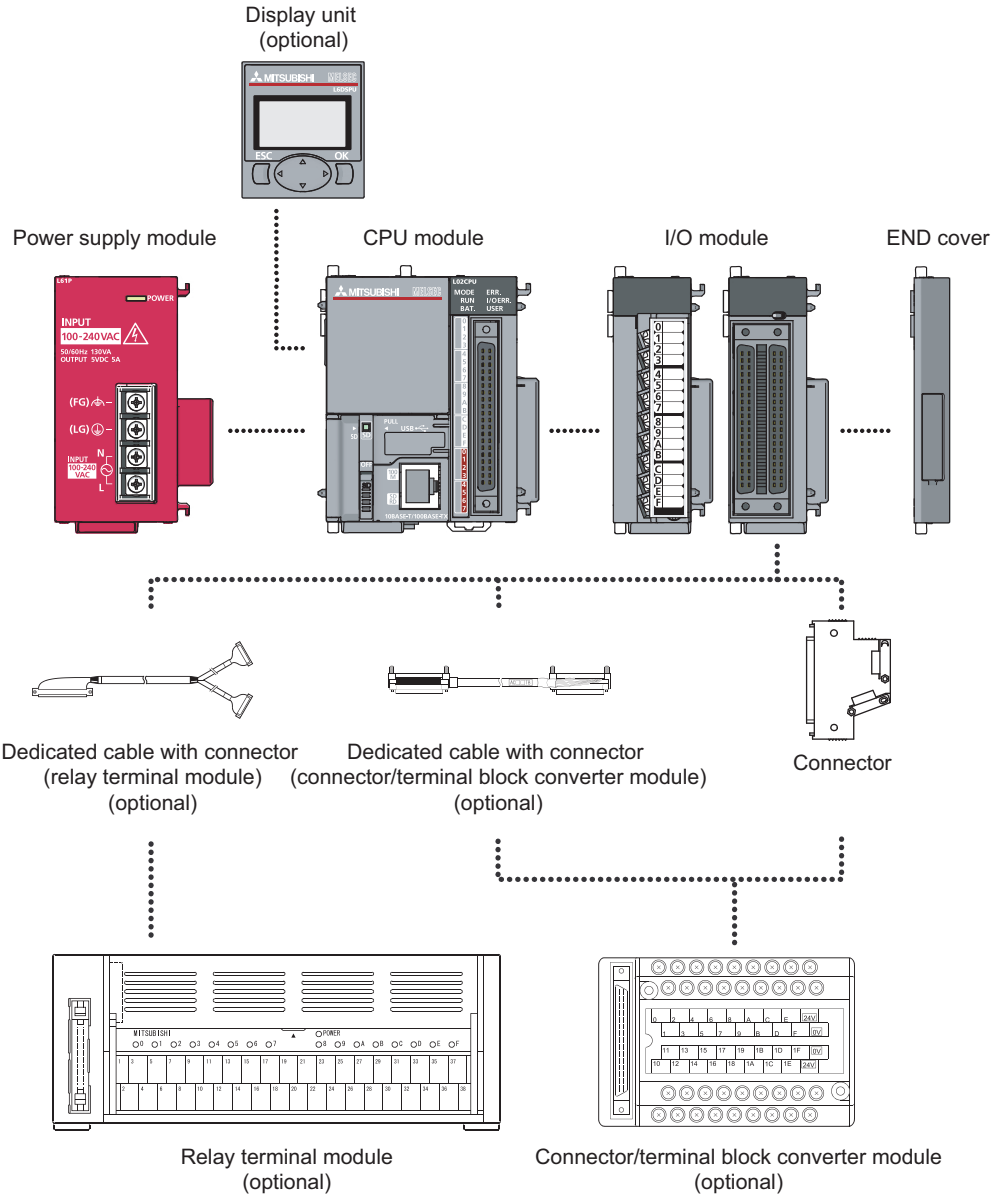
*1 Switching left side (F) provides the input (X00 to X1F) LED indications, and switching right side (L) provides the output (Y00 to Y1F) LED indications.

CHAPTER 5 SYSTEM CONFIGURATION

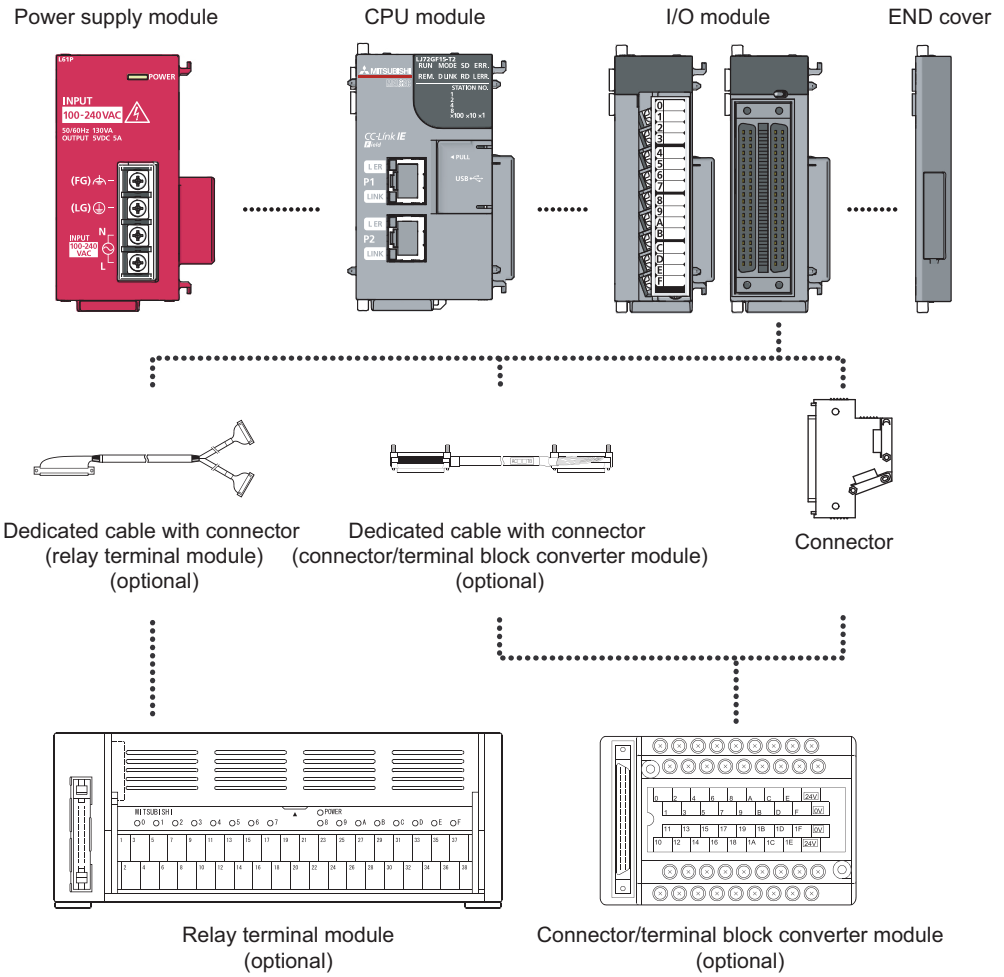
(1) System configuration using I/O module

An example of overall system configuration using MELSEC-L series I/O modules is shown below.

(a) Mounting to a CPU module



(b) Mounting to a head module



(2) Optional products

The following optional products can be used for easy wiring of modules.

(a) Display unit

This unit has a liquid crystal display and can be attached to the CPU module. When attaching it to the CPU module, It enables confirmation of system conditions and changing system settings without GX Works2 or GX Developer.

For the details, refer to the following.

MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

(b) Connector/terminal block converter module and dedicated cable with connector

These are used for easy wiring from connector type I/O module to terminal for external wiring. (Page 81, Appendix 1)

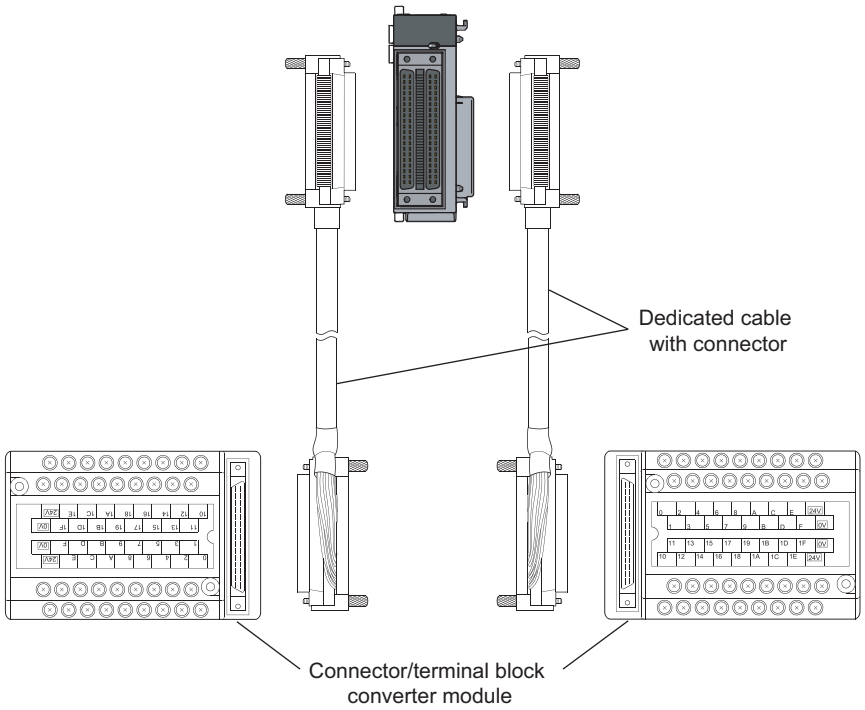
(c) Relay terminal module and dedicated cable with connector

These are used in place of joint terminal blocks and in-panel relays to reduce wiring work processes for them and programmable controllers.

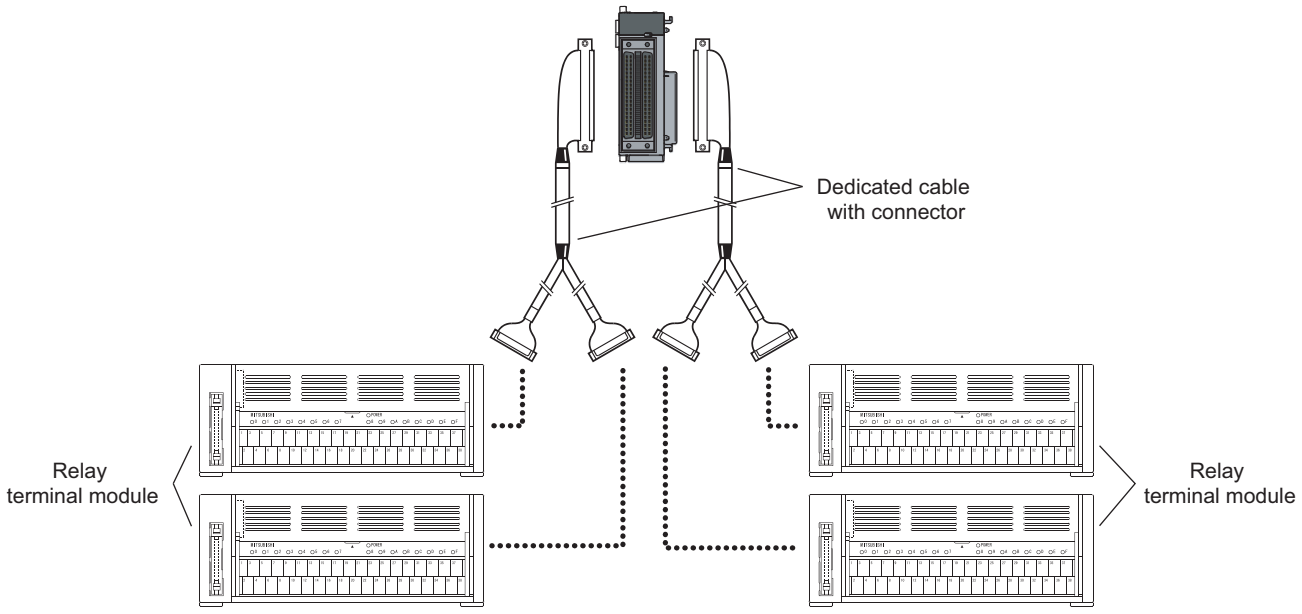
For details on the relay terminal module and the dedicated cable with connector, refer to the following.

Relay Terminal Module User's Manual (Hardware) A6TE2-16SRN

(3) Connection with the connector/terminal block converter module



(4) Connection with the relay terminal module



CHAPTER 6 INSTALLATION AND WIRING

6.1 Installation Environment and Installation Position

For installation environment and installation position, refer to the following.

MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

MELSEC-L CC-Link IE Field Network Head Module User's Manual

6.2 Wiring

6.2.1 For the 18-point screw terminal block module

(1) Precautions

- Always use a solderless terminal of 0.8mm or less in thickness. Up to two solderless terminals can be connected to one terminal block.
- A solderless terminal with insulation sleeve cannot be used for a terminal block. To prevent a short when screws come loose, the junction of a solderless terminal and a cable should be covered up with a cable tag or an insulation tube.
- Use the following wire for the terminal block.

Applicable wire size	Material	Temperature rating
0.3 to 0.75mm^2 (22 to 18 AWG) (stranded wire) Outside diameter: 2.8mm or less	Copper	75°C or more

- Use UL-approved R1.25-3 solderless terminal.
- Tighten the terminal block screws within the following specified torque range.

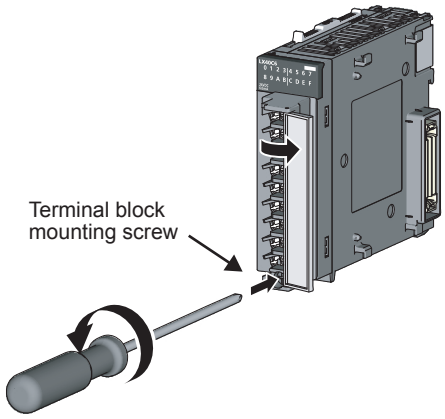
Screw type	Tightening torque range
Terminal block screw (M3)	0.42 to 0.58N·m
Terminal block mounting screw (M3.5)	0.66 to 0.89N·m

(2) Wiring method for the terminal block

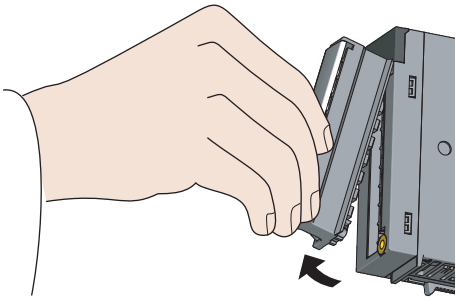
For the wiring method, refer to the following.

MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

(3) Removal procedure for the terminal block

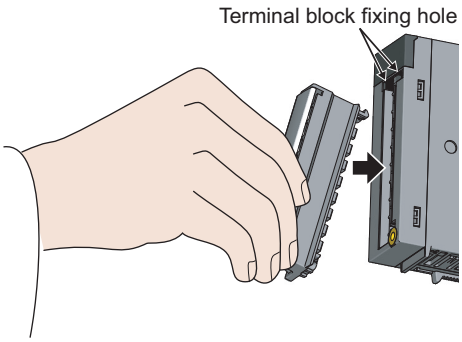


1. **Open the terminal cover and loosen the terminal block mounting screw.**

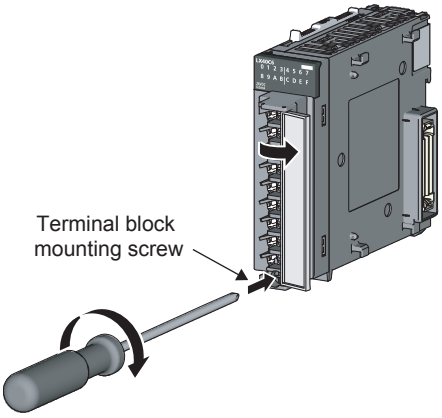


2. **Press the terminal block fixing holes until the lower part of the terminal block is disengaged from the module, and then remove the terminal block.**

(4) Installation procedure for the terminal block



1. **Fully insert the projections on the top of the terminal block into the terminal block fixing holes and press the terminal block until it snaps into place.**



2. **Open the terminal cover and tighten the terminal block mounting screw.**

6.2.2 For the 40-pin connector type module

(1) Precautions

- Use copper wires having temperature rating of 75°C or more for the connectors.
- Tighten the connector screws within the following specified torque range.

Screw type	Tightening torque range
Connector screw (M2.6)	0.20 to 0.29N·m

(2) Applicable connectors

The 40-pin connector for input module, output module, or I/O combined module is obtained by user.
The following tables list the 40-pin connectors, crimp tool, and pressure-displacement tools.

(a) 40-pin connector

Type	Model Name	Applicable wire size	Applicable models
Soldering connector (straight out type)	A6CON1*1	0.08 to 0.3mm^2 (28 to 22 AWG) (stranded wire)	LX41C4, LX42C4, LY41NT1P, LY42NT1P, LY41PT1P, LY42PT1P, LH42C4NT1P, LH42C4PT1P
Crimp connector (straight out type)	A6CON2	0.088 to 0.24mm^2 (28 to 24 AWG) (stranded wire)	
Pressure-displacement connector (straight out type)	A6CON3	28 AWG (stranded wire) 30 AWG (single wire) Flat cable of 1.27mm pitch	
Soldering connector (both for straight out and 45-degree types)	A6CON4*1	0.088 to 0.3mm^2 (28 to 22 AWG) (stranded wire)	

*1 Use cables with outside diameter of 1.3mm or shorter to connect 40 cables to the connector.
In addition, consider the amount of current to be used and select appropriate cables.

(b) Crimp tool and pressure-displacement tools for the 40-pin connectors

Type	Model name	Contact
Crimp tool	FCN-363T-T005/H	FUJITSU COMPONENT LIMITED
Pressure-displacement tool	FCN-367T-T012/H (locator plate)	
	FCN-707T-T001/H (cable cutter)	
	FCN-707T-T101/H (hand press)	

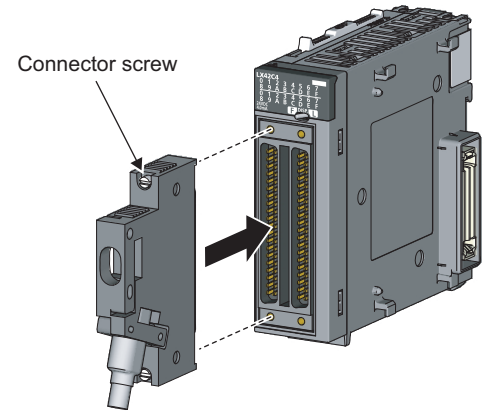
For wiring of connector and usage of crimp tool and pressure-displacement tool, contact FUJITSU COMPONENT LIMITED.

(3) Wiring method for the 40-pin connector

For the wiring method, refer to the following.

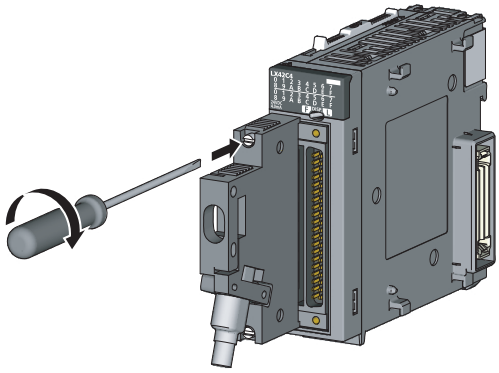
MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

(4) Installing procedure for the 40-pin connector.



1. **Plugging the connector**

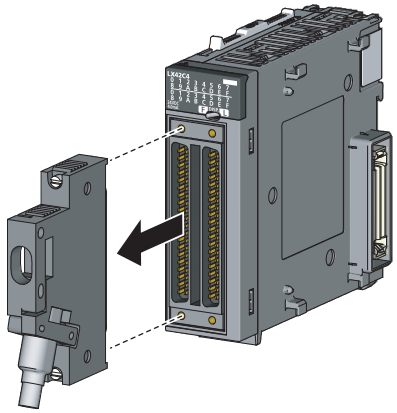
Plug the wired connector into the slot on the I/O module.



2. **Tightening the connector screws**

Tighten the two connector screws (M2.6).

(5) Removal procedure for the 40-pin connector



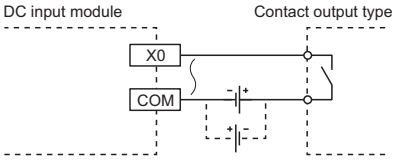
1. **Disconnecting the connector**

Loosen the two connector screws and pull out the connector from the module.

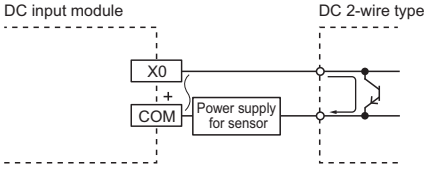
6.3 Input Wiring Examples

The following shows wiring examples of the DC input module to connectable DC input equipments (DC output type).

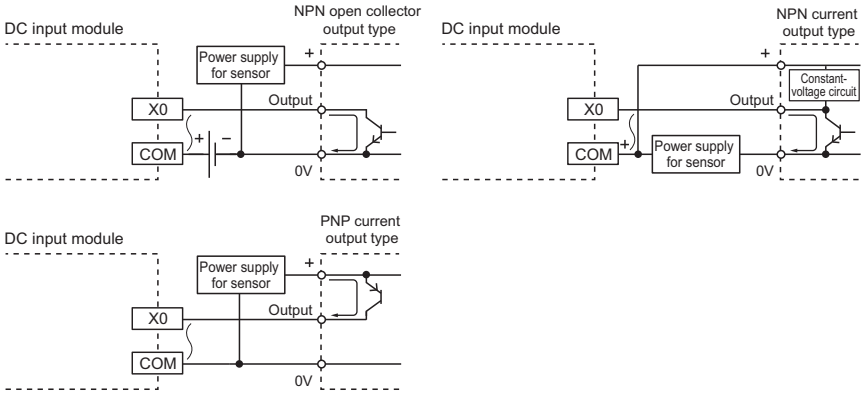
(1) Wiring example with relay output type



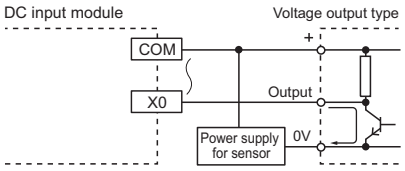
(2) Wiring example with two wire DC type



(3) Wiring example with transistor output type

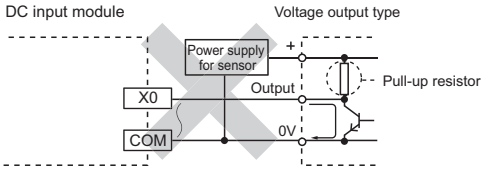


(4) Wiring example with voltage output type



Point

Avoid wiring shown below when connecting with a voltage output type sensor.
This wiring cause current to flow to the DC input module through a pull-up resistor in a sensor. Therefore, input current may not reach ON current of the module and the Input signal does not turn on.



CHAPTER 7 VARIOUS SETTINGS

The following settings for I/O module can be made with GX Works2.

- I/O response time setting
- Error time output mode setting

7.1 Input Response Time Setting

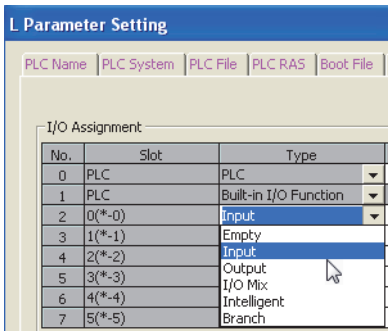
Perform the following procedure.

(When using GX Developer ☞Page 90, Appendix 4 (1))

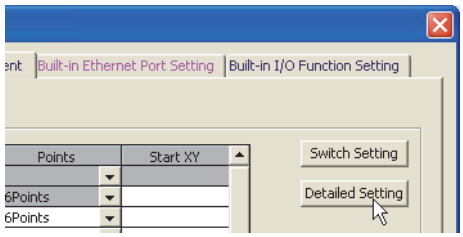
1. Open "I/O Assignment " of "PLC Parameter".

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [I/O Assignment]

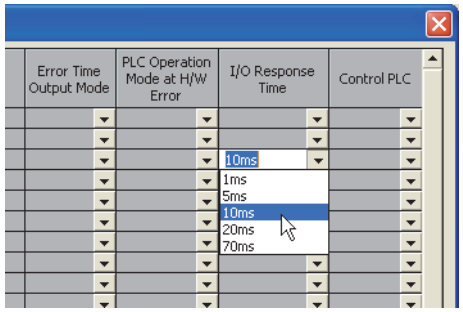
2. Select "Input" or "I/O Mix" in "Type".



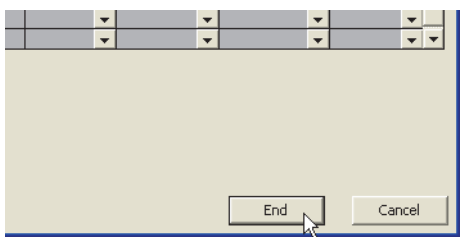
3. Click the Detailed Setting button.



4. Select input response time in "I/O Response Time".



5. Click the End button to finish the input response time setting.



Point

The pulse width that the input module takes as input data differs depending on the input response time.
The pulse width taken as input data differs depending on the input response time.
Therefore, fully consider the operating environment when setting the input response time,

Input response time	Minimum value of pulse width possibly taken as input date
1ms	0.3ms
5ms	3ms
10ms	6ms
20ms	12ms
70ms	45ms

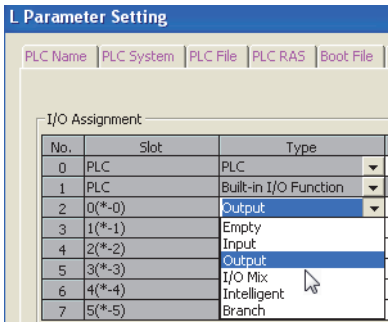
7.2 Error Time Output Mode Setting

Perform the following procedure.

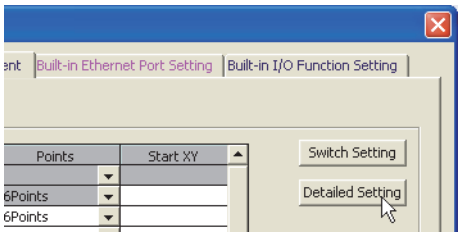
(When using GX Developer ☞Page 90, Appendix 4 (2))

1. Open "I/O Assignment" of "PLC Parameter".

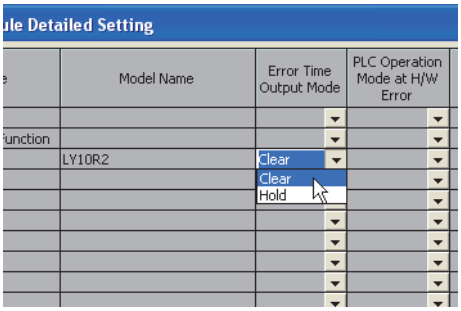
Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [I/O Assignment]



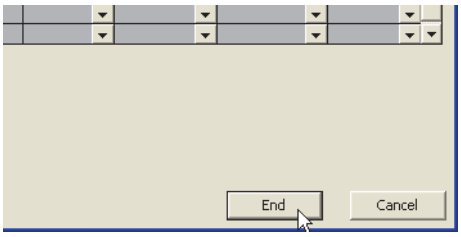
2. Select "Output" or "I/O Mix" in "Type".



3. Click the Detailed Setting button.



4. Select "Clear" or "Hold" in "Error Time Output Mode".



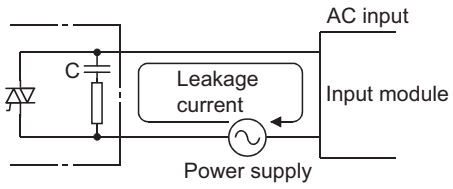
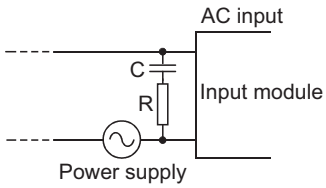
5. Click the End button to finish the error time output mode settings.

CHAPTER 8 TROUBLESHOOTING

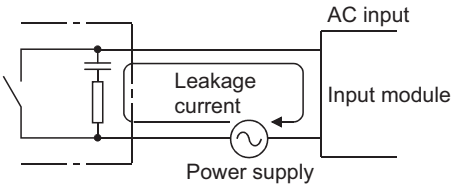
8.1 Troubleshooting for Input Circuit

(1) An input signal does not turn off.

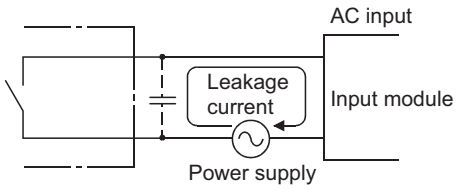
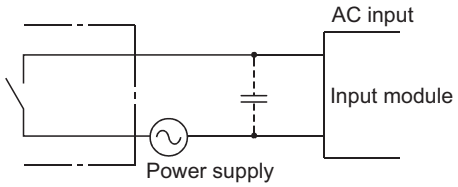
(a) Case 1

Case	
Cause	• The leakage current of an input switch occurred. (e.g. drive by a contactless switch) 
Action	• Connect an appropriate resistor so that the voltage across the terminals of the input module is lower than the OFF voltage.  For the CR constant, 0.1 to 0.47μF + 47 to 120Ω (1/2W) is recommended.

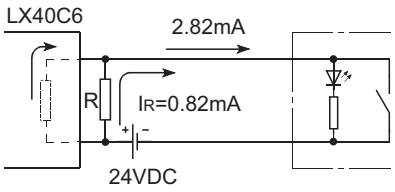
(b) Case 2

Case	
Cause	• The leakage current of an input switch occurred. (e.g. drive by a limit switch with neon lamp) 
Action	Take either of following actions. • Connect an appropriate resistor so that the voltage across the terminals of the input module is lower than the OFF voltage (same action as the case 1). • Separately configure a display circuit that is independent from the existing circuit.

(c) Case 3

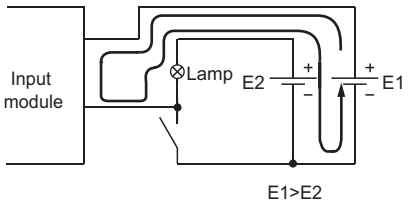
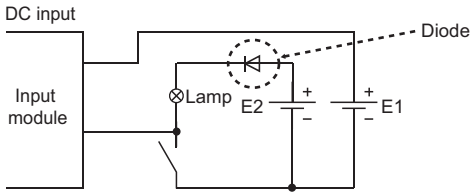
Case	
Cause	• A leakage current occurred due to the line capacity of a wiring cable. (The line capacity C of a twisted pair cable is approx. 100pF/m.) 
Action	• Connect an appropriate resistor so that the voltage across the terminals of the input module is lower than the OFF voltage (same action as the case 1). Note that a leakage current does not occur if the power supply is located in the side where an input equipment is connected as shown below. 

(d) Case 4

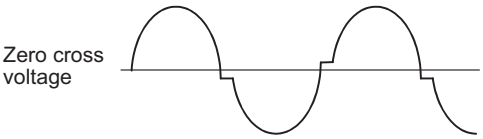
Case	
Cause	A current exceeding the off current of the module leaks even after a switch with LED indicator is turned off.
Action	Connect an appropriate resistor so that a current through the module may become lower than the off current. Iz=2.0mA Input impedance 3.8kΩ 

Case	
Calculation example	The resistance value of a connected resistor is calculated by the following formula. **Ex.** A switch with LED indicator that generates a current leakage of 2.82mA when 24VDC is supplied is connected to the LX40C6. Check the following with the specifications of the module. • Off current: 2.0mA • Input resistance. 3.8kΩ I(Leakage current)$=I_Z$(Off current of the LX40C6)$+I_R$(Current flowing to connected resistor) $I_R=I-I_Z=2.82-2.0=0.82$[mA] To hold the current leakage through the LX40C6 equal to or lower than the off current (2.0mA), connect a resistor so that 0.82mA or more current flows to the resistor. Calculate the resistance value (R) of the connected resistor as follows. I_R: $I_Z=Z$(Input impedance): R $R < \frac{I_Z}{I_R} \times Z(\text{Input impedance}) = \frac{2.0}{0.82} \times 3.8 = 9.27[\text{k}\Omega]$ →The resistance value R < 9.27kΩ must be met. <Checking a connected resistor by calculating the power capacity.> When the resistor (R) is 8.2kΩ, for example, the power capacity (W) of the resistor (R) is calculated as follows. $W=\frac{(\text{Input voltage})^2}{R}=\frac{28.8^2}{8200}=0.101[\text{W}]$ Since the resistor requires the power capacity of 3 to 5 times as large as the actual power consumption, the resistor connected to the terminal should be 8.2kΩ and 1/3 to 1/2 W. Off voltage when the resistance (R) is connected is calculated as follows. $\frac{1}{\frac{1}{8.2[\text{k}\Omega]}+\frac{1}{3.8[\text{k}\Omega]}} \times 2.82[\text{mA}]=7.32[\text{V}]$ This meets the condition: less than or equal to the off voltage of the LX40C6, 8V.

(e) Case 5

Case	
Cause	By using two power supplies, a sneak path has been configured. 
Action	• Use one power supply. • To prevent the sneak path, connect a diode as shown below. 

(2) An input signal does not turn on. (AC input module)

Case	
Cause	Stepwise distortions as shown below appear to the zero cross voltage of an input signal (AC). 
Action	Improve the input signal waveform by using online UPS.

(3) A signal incorrectly inputs data.

Case	
Cause	Noise has been taken as input data.
Action	Set the input response time longer. (☞ Page 68, Section 7.1) Ex. 1ms → 5ms If this action is not effective, also take the following two measures. • To prevent excessive noise, avoid installing power cables together with I/O cables. • Connect surge absorbers to noise-generating devices such as relays and conductors using the same power supply or take other noise reduction measures.

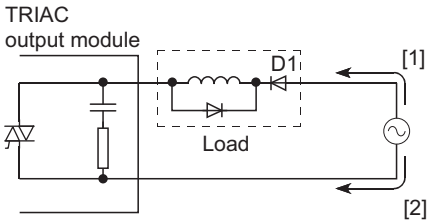
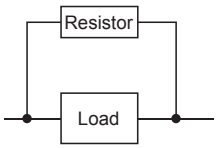
Point

If excessive noise is periodically generated, setting the response time shorter may be effective.

Ex. 70ms → 20ms

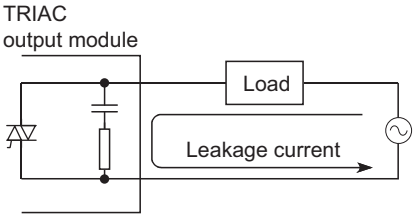
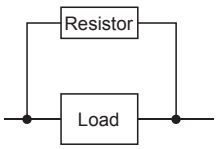
8.2 Troubleshooting for Output Circuit

(1) When the output is off, excessive voltage is applied to the load (triac output).

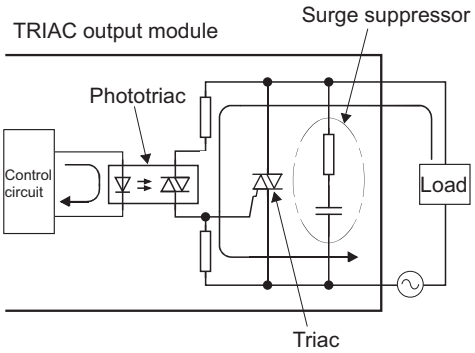
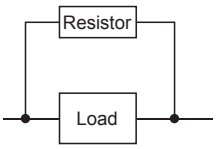
Case	
Cause	• The load is half-wave rectified internally. (In some cases this is true of solenoids.)  • When the polarity of the power supply is as shown in [1], C is charged. When the polarity is as shown in [2], the voltage charged in C plus the line voltage are applied across D1. Maximum voltage is approx. 2.2E. (If a resistor is used in this way, it does not pose a problem to the output element. But it may cause the diode, which is built into the load, to deteriorate, resulting in a fire, etc.)
Action	• Connect a resistor (several tens to hundreds of kΩ) across the load. 

(2) The load does not turn off (triac output).

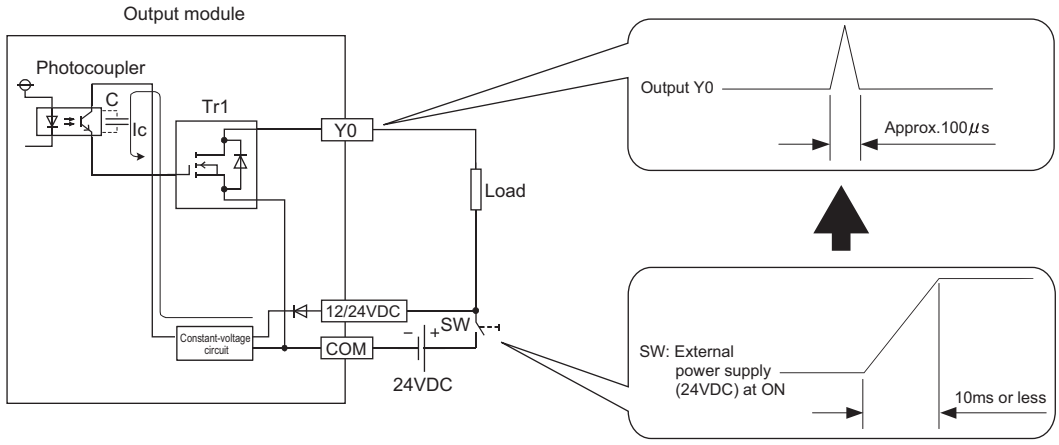
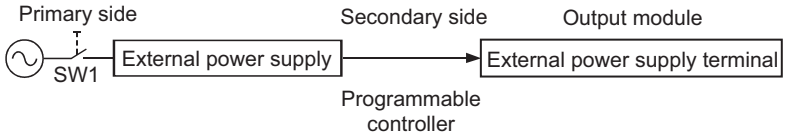
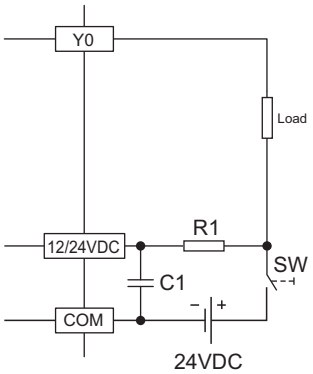
(a) Case 1

Case	
Cause	• A leakage current occurred due to a built-in surge suppressor. 
Action	• Connect a resistor across the load. (Note that a leakage current may occur due to the line capacity when the wiring distance from the output module to the load is long.) 

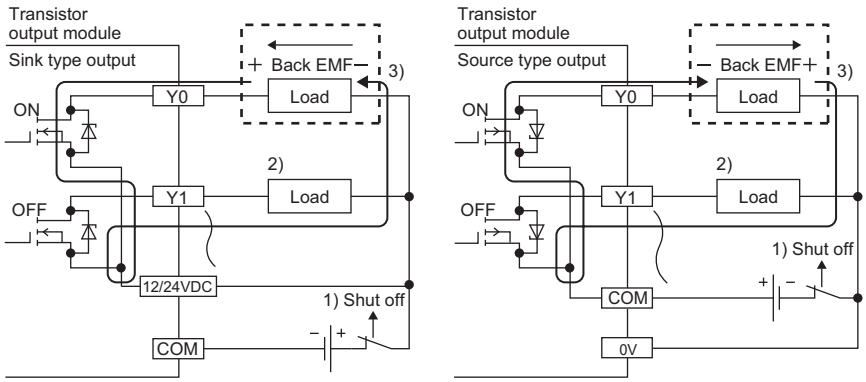
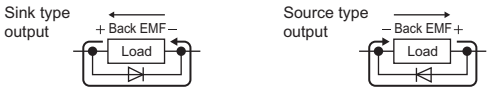
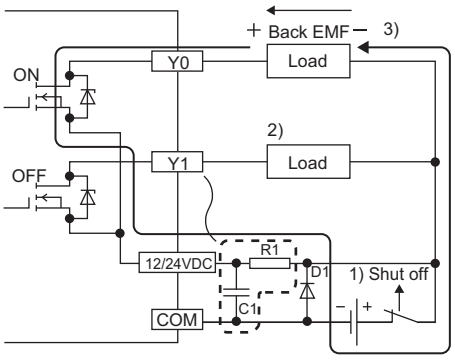
(b) Case 2

Case	
Cause	• The load current is lower than the minimum load current of the output module.  • In such a case, the load current flows into a phototriac as shown above because the triac does not operate. If an inductive load is connected with the load current flowing into a phototriac, the load may not turn off because the surge at the time of off is applied to the phototriac.
Action	• Connect a resistor across the load so that the load current is equal to or higher than the minimum load current. 

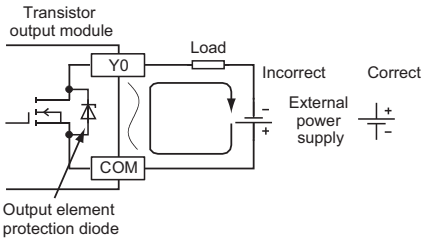
(3) A load momentarily turns on when powering on the external power supply.

Case	
Cause	An incorrect output occurs due to floating capacitance(C) between collector and emitter of photocoupler. When a high sensitivity load (such as solid state relay) is used, this incorrect output may occur.  When the rise time of voltage of the external power supply is 10ms or less, current (Ic) flows to gate of transistor (Tr1) of next stage due to floating capacitance (C) between collector and emitter of photocoupler. Then, output Y0 turns on for approx. 100μs.
Action	Action 1: Check that the rise time of the external power supply is 10ms or more. And then, install a switch (SW1) for turning on or off external power supply to the primary side of it.  Action 2: When installing the SW1 to the secondary side of it is required, make the rise time to 10ms or more and connect a capacitor and resistor as shown below. For the following source output modules, take Action 1 on the above due to no effect of Action 2 by the characteristics of the external power supply circuit. • LY40PT5P • LY41PT1P • LH42C4PT1P Sink type output  R1: Several tens of ohms Power capacity ≥ (external power supply current*1)^2 × resistance value × (3 to 5)*2 C1: Several hundreds of microfarads 50V Example R1 = 40Ω, C1 = 300μF Time constant = C1 × R1 = 300 × 10^{-6} × 40 = 12 × 10^{-3} [s] = 12 [ms] *1 Check the consumption current of the external power supply for modules used. *2 Select the power capacity of resistance to be 3 to 5 times lager than the actual power consumption.

(4) A load momentarily turns on from off when the system is powered off (transistor output).

Case	
Cause	When an inductive load is connected, 2) Load may turn on from off due to a diversion of back EMF at 1) Shutoff. 
Action	Take one of two actions shown below. Action 1: To suppress the back EMF, connect a diode to 3) parallel to the load where back EMF is generated.  Action 2: Configure another current path by connecting a diode across positive and negative of the external power supply. When taking the action described in "A load momentarily turns on when powering on the external power supply" (☞ Page 77, Section 8.2 (3)) at a time, connect a diode parallel to C1 and R1. For the following source output modules, take Action 1 on the above due to no effect of Action 2 by the characteristics of the external power supply circuit. • LY40PT5P • LY41PT1P • LY42PT1P • LH42C4PT1P Sink type output  D1 is in the following status. • Reverse voltage VR (VRM) ··· Approximately 10times higher than the rated voltage in the specifications Example 24 VDC → Approximately 200V • Forward current IF (IFM) ····· More than twice as much as the maximum load current (common) in the specifications Example 2A/1 common → 4A or more

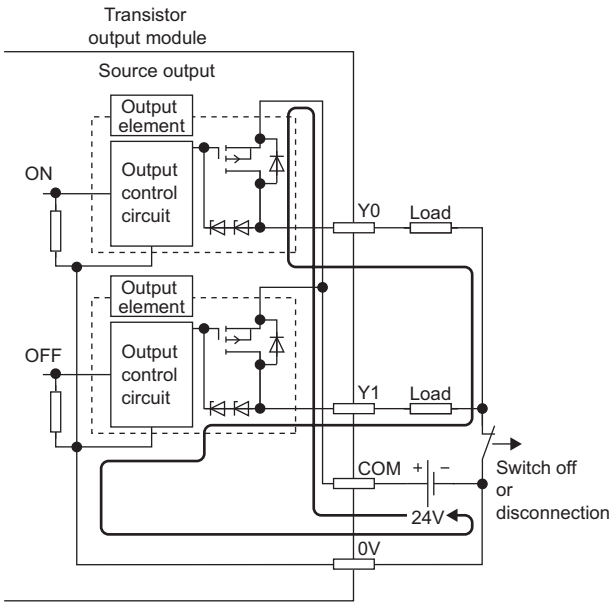
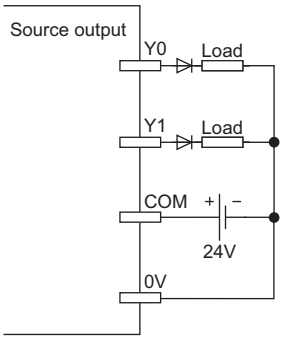
(5) The load operates due to powering on the external power supply (transistor output).

Case	
Cause	• The polarity of the external power supply is connected in reverse.  • When the polarity is connected in reverse, current may flow across an output element protection diode.
Action	Connect the polarity correctly.

(6) The load operates by incorrect input due to chattering of the external power supply.

Case	
Cause	The device whose input response speed is too fast is connected to the contact output module.
Action	Use a transistor output module.

(7) When an output is turned on, a load connected to the other output is also turned on (transistor output (source type)).

Case	
Cause	If the wire connecting 0V of an external power supply and a common of a load is cut off or disconnected, a current flows to the load that is off due to a parasitic circuit of the output element that is off.  If a current keeps flowing under the above condition, a failure may occur.
Action	Connect the external power supply and loads correctly. To prevent the condition described above, connect a diode to each output terminal as shown below. 

APPENDICES

Appendix 1 Optional Items

Appendix 1.1 Connector/terminal block converter modules

Model Name	Description	Weight	Applicable wire size	Applicable solderless terminal
A6TBXY36	For positive common type input module and sink type output module (Standard type)	0.4kg	0.75 to 2mm^2	1.25-3.5(JIS) 1.25-YS3A V1.25-M3 V1.25-YS3A 2-3.5(JIS) 2-YS3A V2-S3 V2-YS3A
A6TBXY54	For positive common type input module and sink type output module (Two-wire type)	0.5kg		
A6TBX70	For positive common type input module (Three-wire type)	0.6kg		

(1) Included item

Product name	Description	Quantity
Screws (M4 × 25)	Used for installing connectors/terminal block converter modules on the control panel.	2

(2) Applicable connector/terminal block converter modules for the I/O modules

Name	Model Name		A6TBXY36	A6TBXY54	A6TBX70
Input module*1	LX41C4		○	○	○
	LX42C4		○	○	○
Output module	LY41NT1P		○	○	×
	LY42NT1P		○	○	×
	LY41PT1P		○	○	×
	LY42PT1P		○	○	×
I/O combined module	LH42C4NT1P	Input side*1	○	○	○
		Output side	○	○	×
	LH42C4PT1P	Input side*1	○	○	○
		Output side	○	○	×

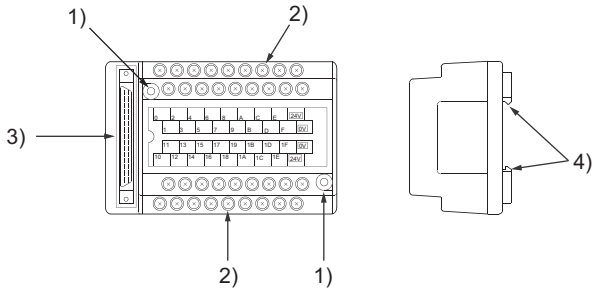
*1 Applicable only when using the positive common type module.

Point

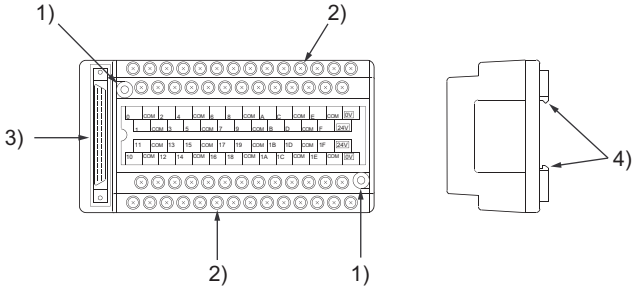
- The number of connectable I/O points is 32 for all connector/terminal block convertor modules.
  Therefore, two connector/terminal block convertor modules and two cables is required for the 64-point I/O module.
- Tighten the module terminal screws within the following torque.
  Terminal screw (M3.5) ····· Tightening torque 0.78N·m

(3) Part names

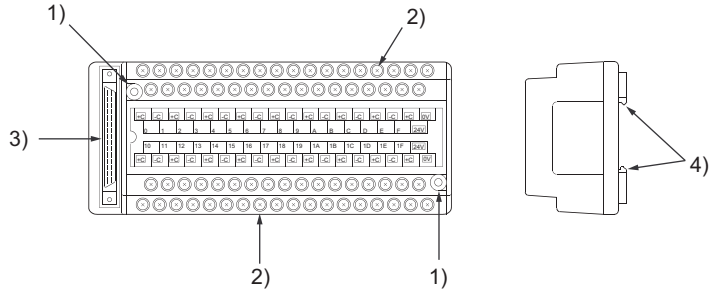
A6TBXY36



A6TBXY54



A6TBX70

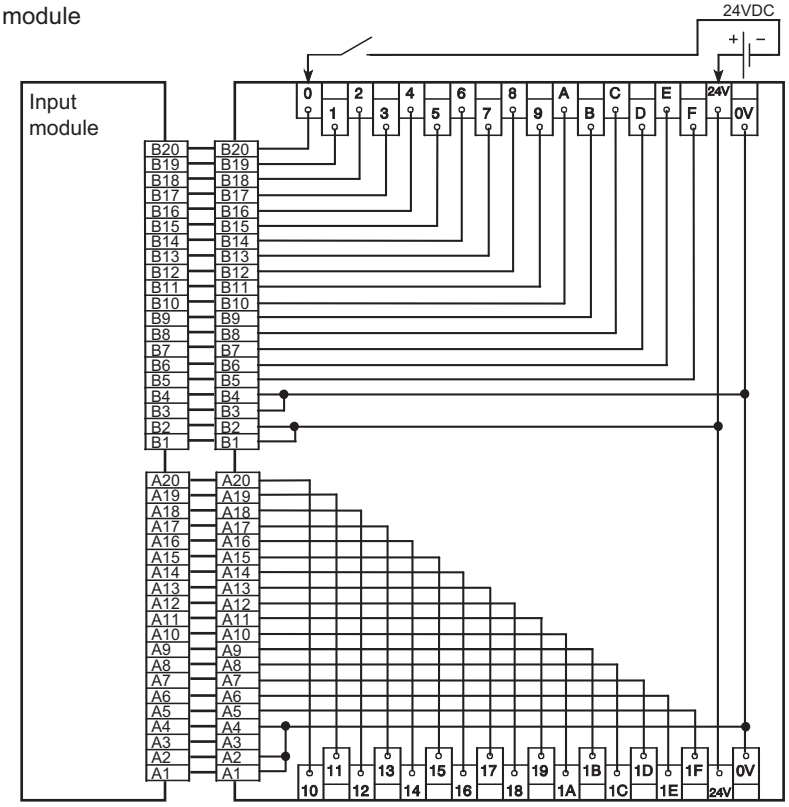


No.	Name	Description
1)	Panel mounting holes	Used to mount the module to panel (for included screws(M4)).
2)	Terminal blocks	Used to connect power supply and I/O signal wires.
3)	40-pin connector	Used to connect the AC□□TB. (☞ Page 87, Appendix 1.3 (1))
4)	Module joint levers	Used to mount the module to a DIN rail.

(4) Terminal connections

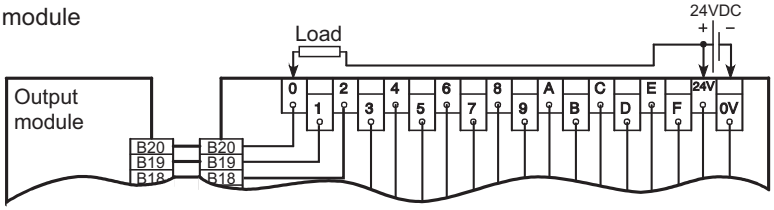
- A6TBXY36

When connecting an input module

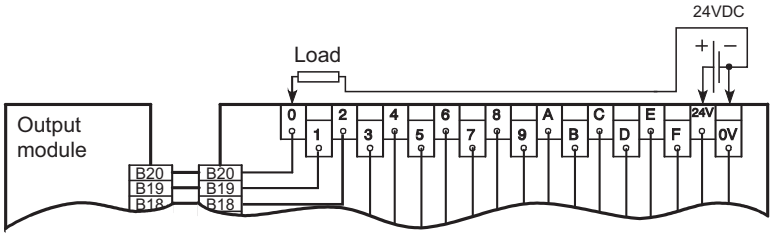


When connecting an output module

Sink type

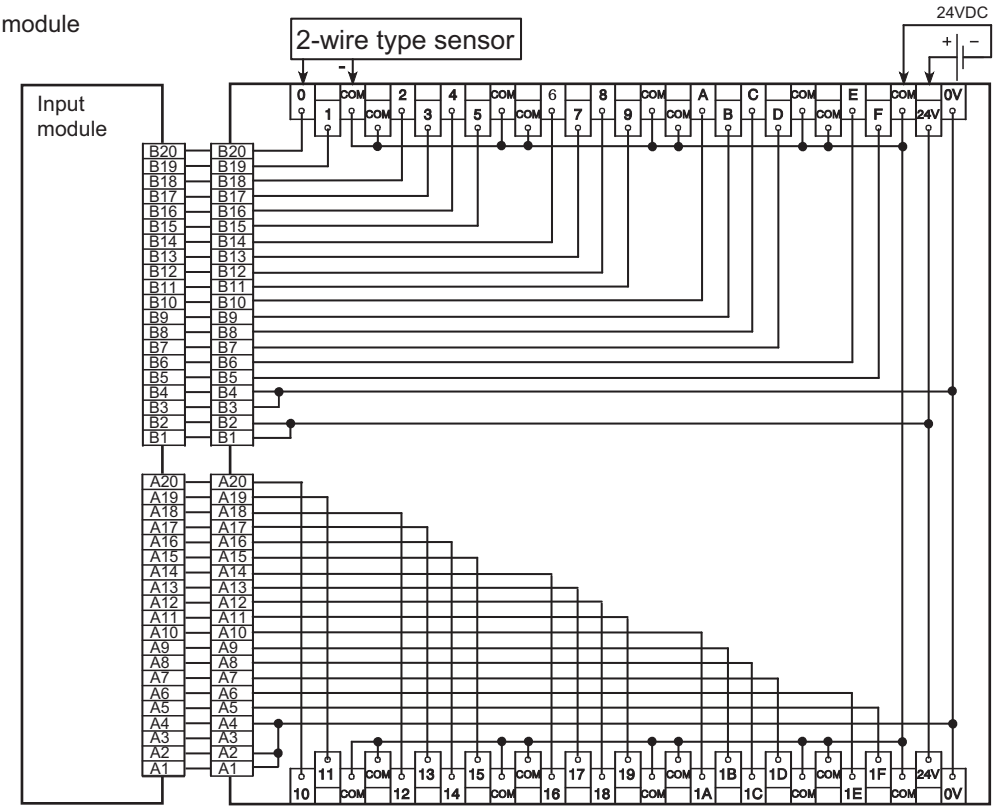


Source type



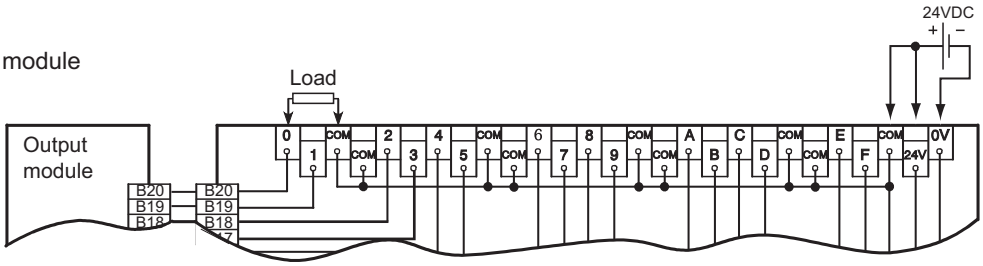
- A6TBXY54

When connecting an input module

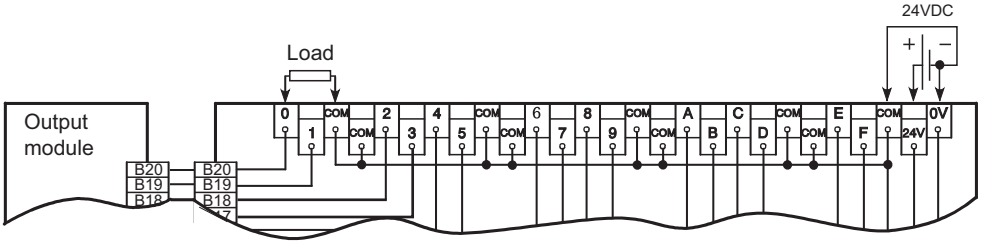


When connecting an output module

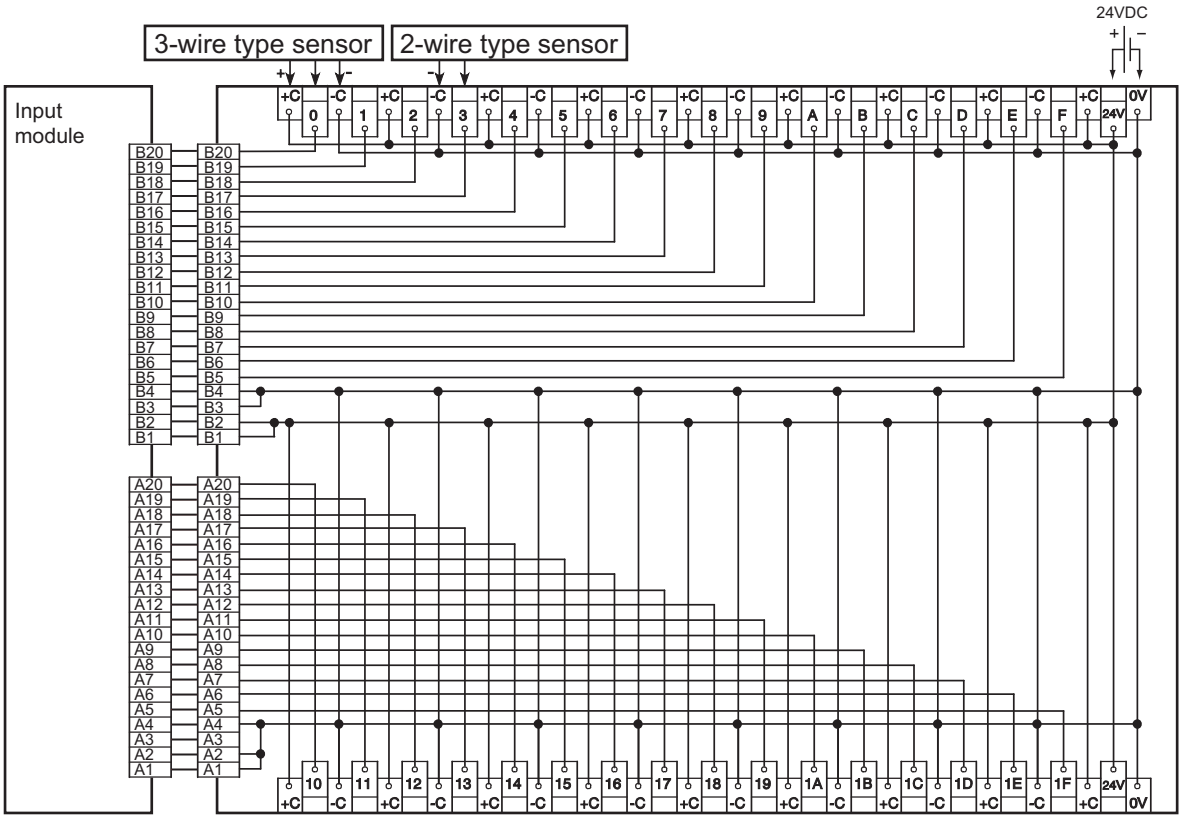
Sink type



Source type



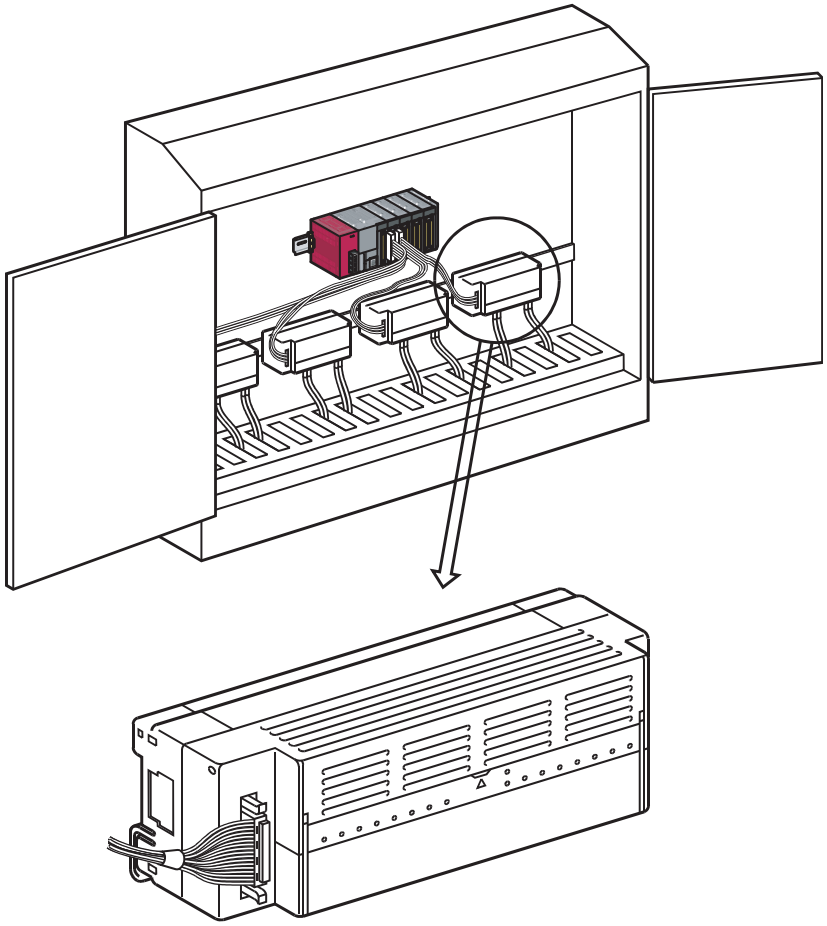
- A6TBX70


3-wire type sensor
2-wire type sensor
24VDC
Input module
B20 B19 B18 B17 B16 B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 B2 B1
A20 A19 A18 A17 A16 A15 A14 A13 A12 A11 A10 A9 A8 A7 A6 A5 A4 A3 A2 A1
+C -C 0 1 2 3 4 5 6 7 8 9 A B C D E F 24V 0V
+C -C 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 24V 0V

Appendix 1.2 Relay terminal module (A6TE2-16SRN)

The A6TE2-16SRN is used in place of joint terminal blocks and in-panel relays for saving man-hour for wiring across a programmable controller, a relay terminal block and relays in the control panel.
For details on the relay terminal module and dedicated cables with connector, refer to the following.

Relay Terminal Module User's Manual (Hardware) A6TE2-16SRN



A6TE2-16SRN

Item		Specifications
Output points		16 points
Insulation method		Relay
Rated switching voltage/current		24VDC 2A (resistance load)/point, 8A/common 240VAC 2A (COSϕ = 1)/point
Response time	OFF to ON	10ms or less
	ON to OFF	12ms or less
Surge suppressor		None
Fuse		None
Common terminal arrangement		8 points/common

Appendix 1.3 Dedicated cables with connector

(1) For connector/terminal block converter modules

Model Name	Description	Weight	Applicable models
AC05TB	0.5m, for sink type modules	0.17kg	A6TBXY36 A6TBXY54 A6TBX70
AC10TB	1m, for sink type modules	0.23kg	
AC20TB	2m, for sink type modules	0.37kg	
AC30TB	3m, for sink type modules	0.51kg	
AC50TB	5m, for sink type modules	0.76kg	
AC80TB*1	8m, for sink type modules	1.2kg	
AC100TB*1	10m, for sink type modules	1.5kg	

*1 Voltage drop will grow due to the long length of the cables. When using the AC80TB or the AC100TB, keep the common current 0.5A or less.

(2) For relay terminal modules

Model Name	Description	Applicable models
AC06TE	0.6m, for sink type modules	A6TE2-16SRN
AC10TE	1m, for sink type modules	
AC30TE	3m, for sink type modules	
AC50TE	5m, for sink type modules	
AC100TE	10m, for sink type modules	

Appendix 1.4 Converter modules and interface modules (FA goods)

Converter modules and interface modules are offered by Mitsubishi Electric Engineering Co., Ltd.
For the details, refer to the following website.
http://www.mee.co.jp/

Appendix 2 Checking Serial Number

For checking serial number, refer to the following.

MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

MELSEC-L CC-Link IE Field Network Head Module User's Manual

Appendix 3 Compatibility of L series and Q series I/O module

The following shows compatibility of I/O modules of L series and Q series.

(1) 18-point screw terminal block module

Item	Compatibility with Q series	Differences with Q series
Terminal block	Can not be used.	The form of the terminal block differs from Q series.

(2) 40-pin connector type module

Item	Compatibility with Q series	Differences with Q series
Connector	Can be used. The pin assignment is the same as Q series.	There is no difference.

Appendix 4 When Using GX Developer

This section describes the method of the I/O module settings with GX Developer.

(1) Input response time setting

Set the input response time in I/O Assignment of PLC Parameter.

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [I/O Assignment]

The setting method is the same as when using GX Works2. (Page 68, Section 7.1)

(2) Error time output mode setting

Set the error time output mode in the I/O Assignment of PLC Parameter.

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [I/O Assignment]

The setting method is the same as when using GX Works2. (Page 70, Section 7.2)

(3) I/O assignment setting for I/O combined modules

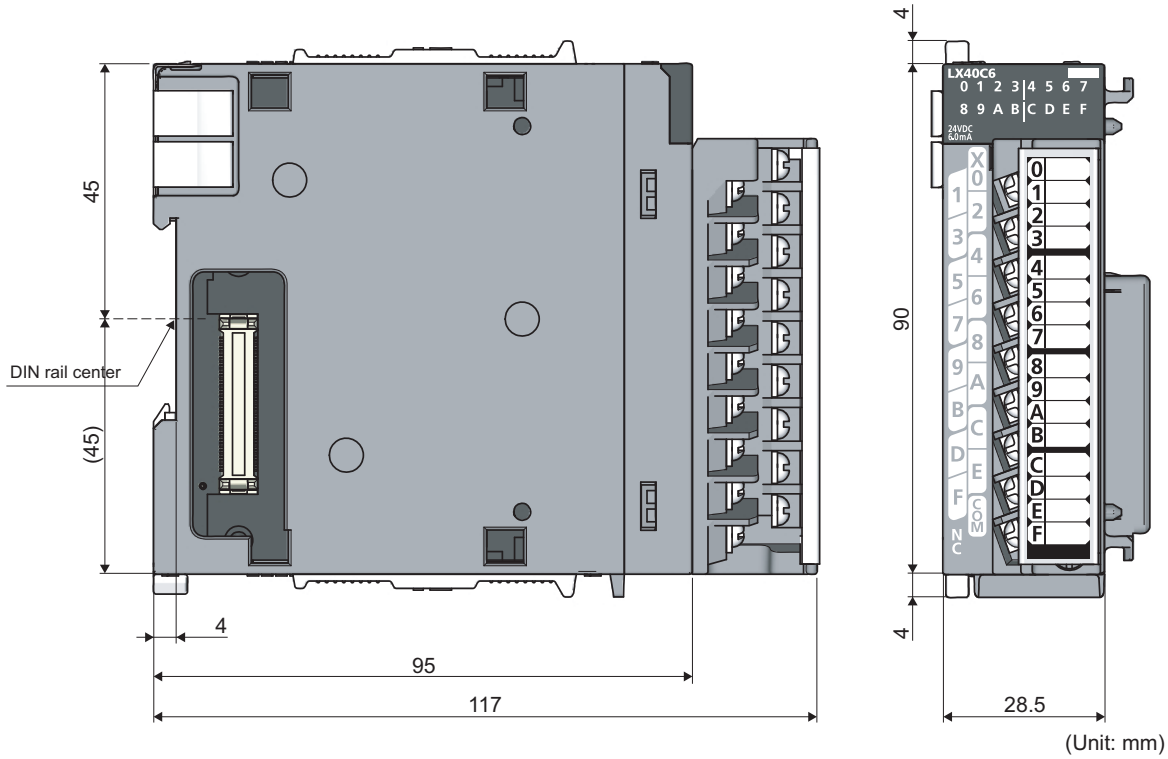
The I/O combined module cannot be set in "I/O Assignment" of GX Developer.

Use GX Works2 with version 1.492N or later.

Appendix 5 External Dimensions

Appendix 5.1 I/O modules

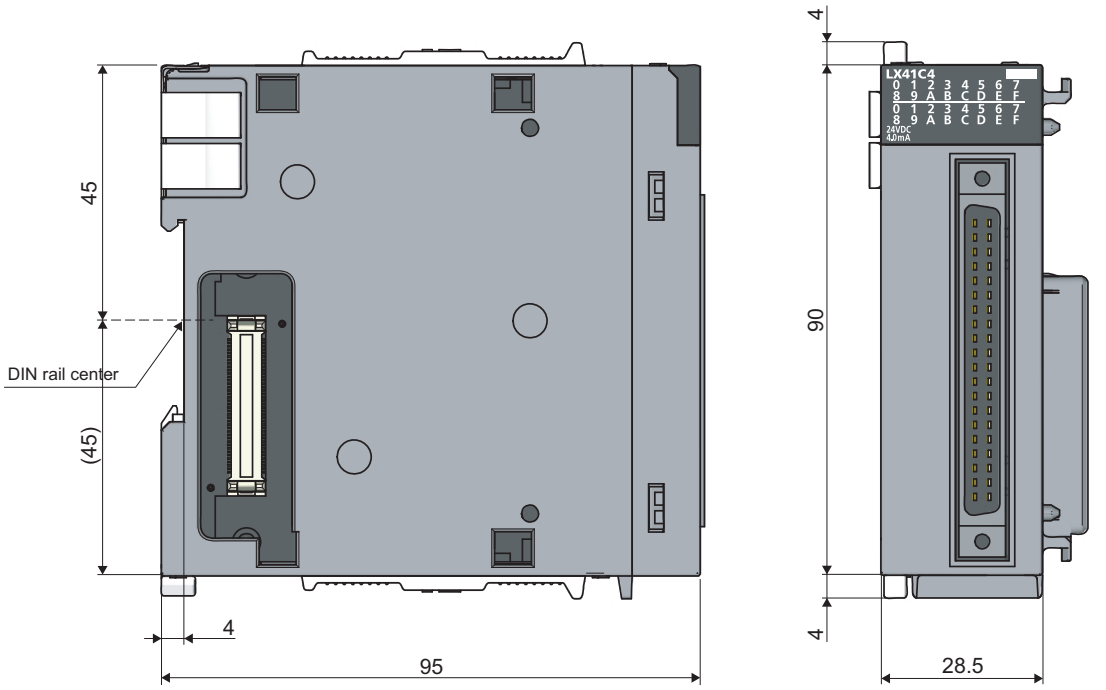
(1) 18-point screw terminal block



(Unit: mm)

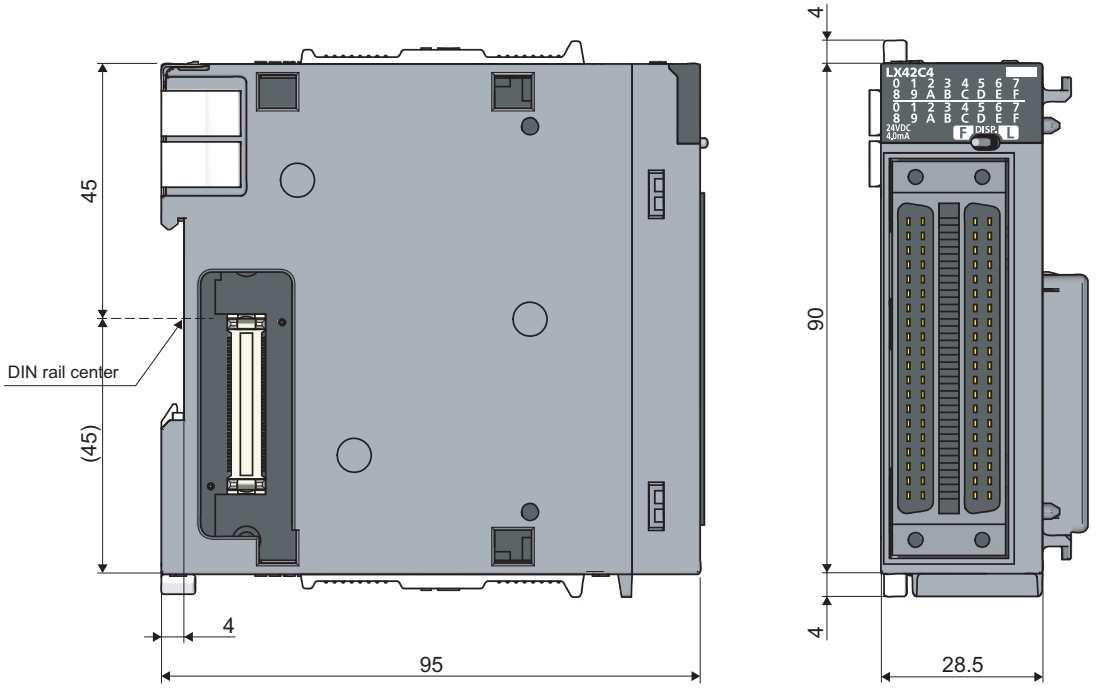
(2) 40-pin connector

(a) 32-point module



(Unit: mm)

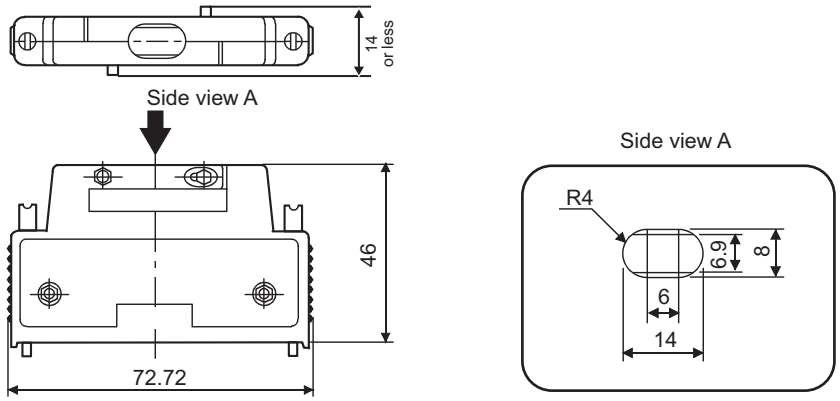
(b) 64-point module



(Unit: mm)

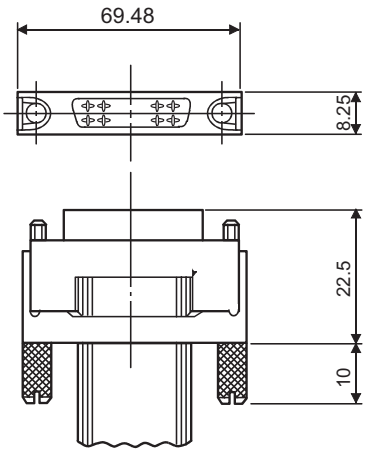
Appendix 5.2 Connectors

· A6CON1 (soldering type 40-pin connector), A6CON2 (crimp-contact type 40-pin connector)



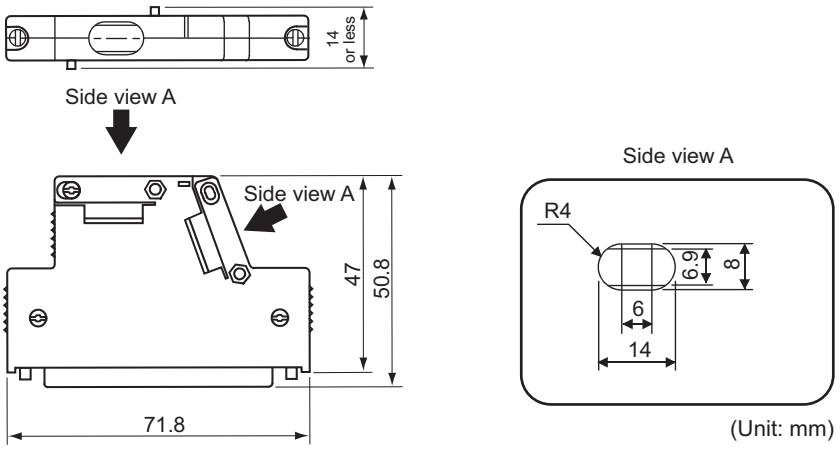
(Unit: mm)

· A6CON3 (pressure-displacement type 40-pin connector)



(Unit: mm)

· A6CON4 (soldering type 40-pin connector)

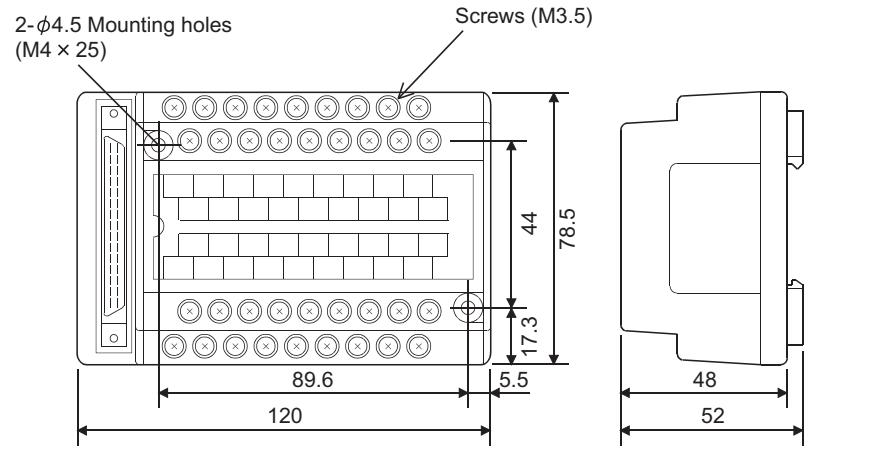


(Unit: mm)

The cable may run off from the cable cramp when the size is thinner than that of the cramp.
In that case, fix the cable by winging tape around it.
When the cable is made of slippery material, take anti-slip measures such as winding rubber-based tape.

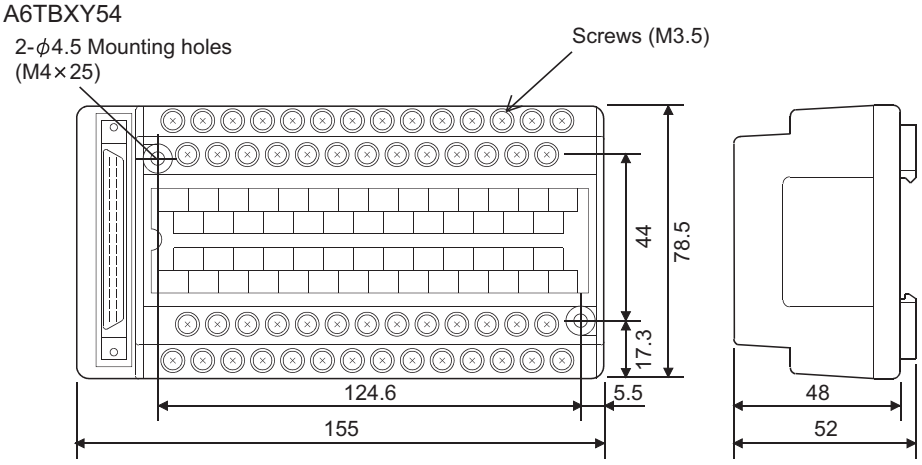
Appendix 5.3 Connector/terminal block converter modules

A6TBXY36



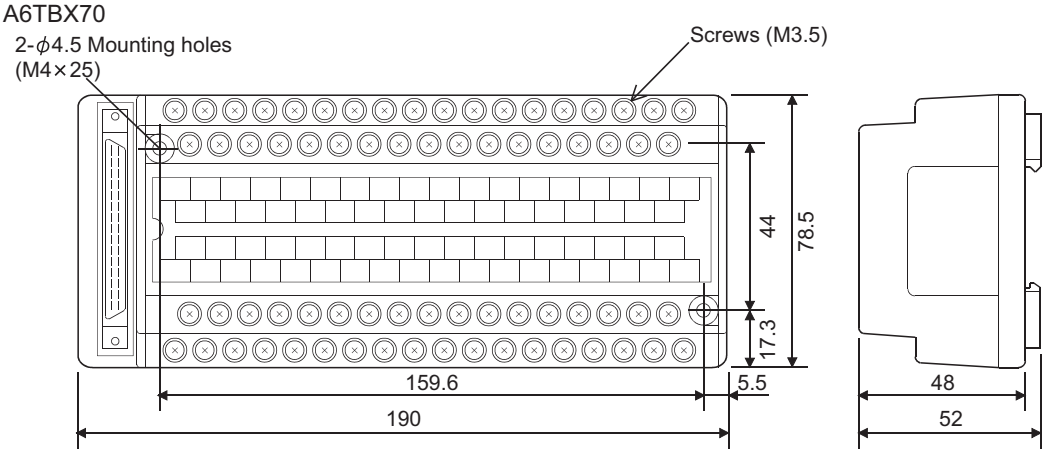
(Unit: mm)

A6TBXY54



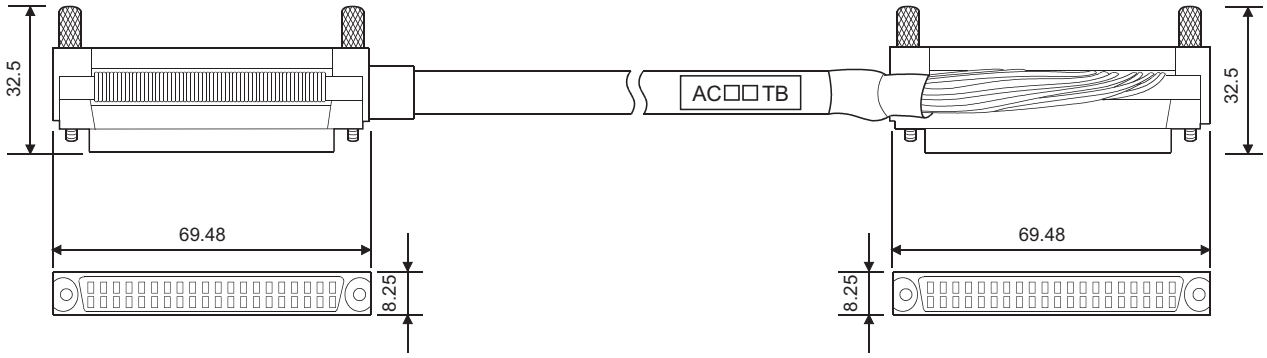
(Unit: mm)

A6TBX70



(Unit: mm)

Appendix 5.4 Cable for connector/terminal block converter module



(Unit: mm)

REVISIONS

*The manual number is given on the bottom left of the back cover.

Print date	*Manual number	Revision
January 2010	SH(NA)-080888ENG-A	First edition
April 2010	SH(NA)-080888ENG-B	Descriptions regarding the LX41C4 and LY41NT1P are added.
October 2010	SH(NA)-080888ENG-C	Descriptions regarding the LY40NT5P, LY40PT5P, LY41PT1P, and LY42PT1P are added.
April 2012	SH(NA)-080888ENG-D	Descriptions regarding the LX10, LX28, and LY20S6 are added.
July 2013	SH(NA)-080888ENG-E	Descriptions regarding the LH42C4NT1P and LH42C4PT1P are added.
December 2013	SH(NA)-080888ENG-F	Applicable wire sizes of A6CON1 and A6CON4 are modified.
July 2014	SH(NA)-080888ENG-G	Descriptions regarding the LY18R2A and LY28S1A are added.

Japanese manual version SH-080872-I

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WARRANTY

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.
However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion.
Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.
[Gratis Warranty Term]
The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.
Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.
[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.
(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
    1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
    2. Failure caused by unapproved modifications, etc., to the product by the user.
    3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
    4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
    5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
    6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
    7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued.
    Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.
(2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

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SH(NA)-080888ENG-G(1407)MEE
MODEL: L-IO-U-E
MODEL CODE: 13JZ34

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